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USSR Report

SCIENCE AND TECHNOLOGY POLICY

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ORGANIZATION, PLANNING AND COORDINATION

SYSTEM OF MANAGEMENT OF INVENTION NEEDED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 13, 8-21 Jul 86 pp 4-5

[Article by V. Baronin under the rubric "The Problem Close Up": "Manage Scientific and Technical Creativity"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] Nearly a third of the world scientific output is Soviet. From 20 to 25 percent of the new technical solutions, which are registered annually in the world, also originated in our country. The magnitude of the Soviet scientific and technical potential does not arouse doubts either among our friends or in the camp of the enemies. The discovery, for example, of what is called "a solid flame" led to the origination of an unusual technology, for which patents were obtained in Japan, the United States, the FRG, England, and France.... The most developed countries of the world are using technologies and processes, which were developed by our scientists and engineers. The number of concluded license agreements increased during the past five-year plan by 1.7-fold. During this period 380,000 inventions were developed. In all 120,000 were introduced with an economic impact of more than 14 billion rubles. It would seem that there are no problems. But if we look at this entire matter from the standpoint of the spirit and letter of the decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Radical Increase of Product Quality," which was adopted a few days ago, it will become clear that we need an effective system of the management of all aspects of creative inventing work.

The Marker on the Road

Let us begin with an event which ended quite well. It is a question of the development of a hydrobarodynamic device for the cleaning of water mains. Until recently many scientific research institutes and design bureaus focused their attention on the development of all kinds of corrosion-resisting coatings, which did not solve the problems of deposits on the walls of pipes. However, this did not become an obstacle to the flow of applications for inventions and the hardly less powerful influx to developers of inventor's certificates.

But the Krasnodar inventors proposed a device, which is capable of covering at one go 250 kilometers of pipes, while efficiently pushing in front of itself

the sediment which has been removed from their walls. It negotiates turns of up to 90 degrees and if stopped gives off an audible or electric signal. It weighs one-fourth as much as the less productive set of imported equipment for the same purpose, for which, incidentally, they paid 40,000 foreign currency rubles each.

"The end crowns all," folk wisdom says, but this hardly exempts us at least from an elementary analysis of the situation. But it developed as follows. First an inventor's certificate for the device was obtained under No 677,779, then 716,647, 887,041, 956,074, and 1,037,937. And it is not what is wanted. And finally there is a fruitful idea....

There are five inventor's certificates for devices which are inoperative. The number of the first one differs from the last one and, to all appearances, not the final one by more than 370,000. Let us remember: this is nearly a 5-year set of all the inventor's certificates issued in the country. Hence, for not less than 5 years the developers inundated the expert commission with unchecked solutions, appending, of course, all the documents and the certificates and conclusions necessary for recognition.

If this case were unique, one would not have to talk about it. However, in the opinion of the workers of the All-Union Scientific Research Institute of State Patent Examination, the "stir" of our inventor's portfolio is quite large. And the people, who are in a hurry to "stake out" their priority and to issue conclusions, are creating it.

Metaphors, which are strange at first glance, are also occurring with the economic impact from the sale of inventions. At the stage of their registration at times they do not feel sorry for nonentities. They act, apparently, according to the principle: "Whether they recommend someone as finished or for a cozy position, how can one pass over a relative." At the stage of implementation, which might also not occur, no one will ask any longer who issued the conclusion and why he committed a "mistake."

In Tataria, for example, of the 200 developments, which were completed by the institute of the Kazan Affiliate of the USSR Academy of Sciences, during the past three five-year plans one-fifth were brought up to introduction in production. The economic impact came to...4 percent of the estimated impact. And it does not matter, they are alive and well.

Thus an economic stir is added to the technical "stir." Moreover, the production of the former is supported by an impressive scientific basis. Quite recently P.M. Andreyev, a senior expert of the Department of Patent Research of the State Committee for Inventions and Discoveries, showed me calmly, as something that stands to reason, the "successes" of this sort. He produced the calculations of the economic efficiency of one invention, which were made according to the methods of different departments. And it turned out that it is possible to stretch the impact from several tens of thousands to 1 million and a substantial "little more."

But these are not innocent pieces of paper, which it is possible to brush aside. Prepared for the need of immediate use, they, being sanctified by the

authority of state organs and organizations, begin to live by their own logic. And to dictate to us the rules of the game. "Since there is an invention, introduce it; just look how effective it is, here and now...."

And they introduce it, with groaning and delays, but they do introduce it. And poorly made tractors, seeders, televisions, and tape recorders are coming from the walls of the plants. It is "good" that our market is large, while there are not enough goods.

What is one to say about tape recorders?... Buy a Sputnik-404, which was made in Kharkov. Except for a trip three times to the warranty workshop and the possibility of getting your money back you will get nothing.

That is how the "stir" of some inventing, economic, and production reserves works.

I foresee objections: "Well perhaps it is possible to draw such conclusions, everything is not all that bad.... There are objective difficulties...." Incidentally, the representatives of ministries assert their rightness in precisely that way, when they become acquainted with the materials of the checks of the technical level of their items at the All-Union Center of Patent Services (VTsPU). A rapid reaction, a pause, then the desire to get closely acquainted with the method of analysis. In order to overcome the syndrome of imitation and inferiority, which were spoken about at the June (1986) CPSU Central Committee Plenum, it is necessary to call a spade a spade. And we will not be any the worse for anything.

Obstructions on the Road

Only whoever does nothing does not make a mistake. The incorrectness of a portion of the inventions and the conclusions on them does not free us of the need for the choice of highly efficient innovations and their vigorous introduction. Meanwhile precisely the implementation of inventions in equipment and technologies to this day is in a poor way. So much has been written about this that it is no easier to say anything new than to discover a new star. The objects of equipment and the names of inventors and those, who have become skilled in the art of "chasing the rabbit farther," are changing.

The essence remains the same: with enormous difficulty even very useful inventions become accessible to practice. Suffice it to recall those which were named in the Policy Report of the CPSU Central Committee to the 27th party congress.

It is possible, of course, to reassure oneself with the idle arguments that such was the case at all times, what is new, they say, has always encountered the resistance of what is obsolete, that there is also a psychological component of its rejection, and so on and so forth. It is all true, just as it is also true that the times are now different--the cost of delays has become different: what you miss today, tomorrow will be several fold more difficult and expensive to catch up with.

Here they decided in the State Committee for Inventions and Discoveries jointly with the Central Council of the All-Union Society of Inventors and Efficiency Experts to organize something like an anti-exhibition, having displayed at it inventions which for years have not been assimilated in production or exist in one or two copies, although they deserve much greater circulation. It must be said that at first few people believed in the success of this venture. "In the sectors it is not children who are working," they asserted, "who will put himself in the position of a noncommissioned officer's widow?"

They were not mistaken: suggestions on the submitting to the exhibition of more than 1,500 exhibits, which had almost nothing to do with its goal, came from the sectors. In many cases these were prototypes of a product and items, which were assimilated long ago. One could not speak on their basis about unintroduced inventions.

This did not stop the organizers. They inquired about specific objects and turned directly to the inventors and to oblast and republic departments of the All-Union Society of Inventors and Efficiency Experts. In a few months 250 stands, drawing boards, models, and devices took the places assigned to them in one of the halls of the Exhibition of USSR National Economic Achievements.

And the boredom spread.... The board of directors of the exhibition scribbled invitations, to which no one responded, the inventors smoked next to the exhibits and swore in a low voice. It is no laughing matter that, having assumed the role of stand attendants, they were spending their leave uselessly. True, at times minor representatives of ministries, who declared from the threshold that they are people of no importance and, therefore, cannot speak on behalf of the sector, visited the exposition. And in general they said "go" to them and they came.

There was nothing left for the executives of the State Committee for Inventions and Discoveries to do but to appeal for superdepartmental aid. Numbered days remained to the closing of the exhibition. And the ice began to break. They postponed the closing. Ministers, their deputies, chiefs of technical administrations, and chief specialists filled the hall. While at its approaches they required invitations of representatives of other departments--the producers of the innovations and those who are to use them.

Right at the stands the executives of the sectors gave instructions on the preparation of orders, directions, and plans of measures. It was a real pleasure to look.

Be that as it may, the problem with the production of antifriction bearings and glass keramzit facing tiles was solved after all; important decisions were made with respect to several other exhibits.

But one swallow does not make a summer. There are more than enough obstacles in the way of innovations. Even a classification of barriers exists.

First of all it is possible to distinguish them subject to what is being hindered--development or the assimilation of its results. In the former case the conflict is between the participants in the work, in the latter the dispute is between the developers and the production workers.

One should distinguish the idea of an individual inventor from the one which originated in some scientific collective and has, so to speak, its own master. The interests of the inventor and society coincide: to use an innovation more rapidly, especially if it is highly efficient. But the developer--the main sectorial institute--stands between them. It often has its own position, its own plan, and its own version of the technical solution.

It happens that there is no solution, just as there are no instances when an institute without any pressure from outside would agree that its team has worked worse than the collective of another department.

The individual inventor.... This cannot be at all, because it does not happen that way. Given the presently existing procedure the main institute is a party of the dispute and...the judge in it. Everyone knows everything else. If the entire range of possibilities does not work, misinformation comes into play. At one time they also treated the antifriction bearing that way. They said at the interdepartmental commission that there are no orders for it and withdrew the question for several years.

An innovation also encounters opposition at the intersectorial level, at the meeting points between sectorial and academic science. One offers the results of scientific research, the other hinders their transformation into technical solutions.

And all the same the opposition of the current plan and the requirements of scientific and technical progress account for the bulk of instances of delay. Situations of this sort, after all, are frequent. Planning from what has been achieved in case of a lag of retooling has the result that the entire production process is woven as if into a living thread. One or two working women did not show up for work--and some director needs validol. How is one to deal with innovations here? "A hoof is better than a wheel," he will say and will fight to the last ditch.

The fate of an invention also depends on precisely what is being proposed--a process or a product. Technology and a method give in case of introduction an advantage to the enterprise. It obtains the opportunity to produce the same product, but with fewer expenditures.

If an instrument, machine, or item is proposed, the user obtains an impact. But it is not enough to fetch chestnuts for the uncle of enthusiasts. And it is not by chance, therefore, that technologies account for the majority of examples of introduction. And we are selling precisely them through licenses. An item, a machine is needed, but they do not attract. As to major innovations, which could raise productivity by several factors of 10, we drag out their use for many years and...depreciate them.

It is necessary for it to be otherwise. And it is necessary to invent almost nothing all over again. So much has been and is being done around us, that it remains merely to take it and use it.

You will rarely find a medium-sized or large enterprise, at which there is not a design bureau, a pilot experimental section, or a department of new equipment. They are used in many cases in current trivial work: to "attach" a machine tool, to draw a part which has failed, to work out some simple attachment.

I almost forgot: the engineers and technicians of such subdivisions make up the "gold guard," which is the first to storm bases, kolkhozes, and construction projects, to sweep streets in summer, and to knock off ice in winter.

Is it not better to use them for their immediate engineering purpose? Can they not really prepare for assimilation one development or another even on the side? Now, of course, not everyone is yet able to, but many can, and even want to. But it is necessary to free from work beyond their strength those who have lost their skill. One must not, indeed, turn some departments into a version of the rayon departments of social security! Not by chance does a poor engineer seek an office, an enterprise which is a little smaller. He knows: quiet living to advanced age on 130-170 rubles is guaranteed him.

There Is a Possibility!

Take the same Energotekhprom [Technical Experimental Production Enterprise in Power Engineering] of the Ministry of Power and Electrification. NTR (see No 1, 1986, pp 4-5) told about this experience. Now let us look closely at several details.

With what did it begin? With an invention which it had simply not been possible to introduce on an extensive scale. They set up a small design bureau, which in the minimum time found a sufficiently technologically feasible version of the design of equipment and supports for rural electric power supply lines. Then they arranged the attachment to the design bureau of a small machinery and repair plant. Soon flow lines began to leave the walls of the plant in 3 months, and not after 1.5 years. The mass production of supports was developed at tens of plants of the country.

Old residents relate a curious incident. One of the republics ordered from Energotekhprom equipment for reinforced concrete items and received it with exact attachment to the technologies and, having greatly increased the volumes of its own production, rejected the items which it had brought in from the center of the country. The minister of those days was extremely displeased. "Stop your introducing tricks," he scolded the engineers, "all as people have a shortage of capacities, but what do we have--a surplus?..."

How is all this turning out well? Generally speaking, comparatively easily. The design bureau and the small plant have turned into a powerful scientific production enterprise, the engineering corps of which numbers several hundred people. The enterprise is capable of taking a development, an invention at

any stage of readiness and of "making sense of it." Like conducting concrete, for example.

The chief specialist is in charge of each such development. He unites in himself the chief designer, the administrator, and in general all the functions which are necessary for the completion of the job.

He enlists in the work staff members of any department and any scientific or design institute of the country. In his hands are the tactics and strategy of work, the organization of supply, financing--in short, everything, up to the shipment of the finished product and to the moment when its production will not move on to other enterprises. As a rule, 4-6 months pass from the idea to introduction. The quality of the prototype and the trial run is reliably ensured.

But is it really impossible to establish such organizations under ministries, to supplement them with regional ones, and thereby to eliminate a large number of barriers in the way from the idea to introduction? And few assets are needed for this.

The Energotekhprom began, as I have already said, with a small plant. Its program was also adopted. And was fulfilled later on at a different technical level by means of the retooling of the enterprise with the money obtained as a result of introducing activity--real self-sufficiency.

Moreover, there are many machine tools and instruments and much equipment, which are dispersed among hundreds and thousands of nonspecialized works and are being used occasionally. It is necessary to redistribute these assets. There is also no shortage of engineers, designers, and inventors, who with pleasure would replace the duplication of standard technical solutions and the camping on doorsteps in search of places, where it would be possible to stick their idea, with lively, creative, effective work. Thus it is possible to solve a large number of problems by the simple maneuvering of resources.

It would also be no less useful to implement the idea of the State Committee for Inventions and Discoveries: to establish under the committee at least a small network of introducing organizations, having included in them technological and design subdivisions. Here it will be possible to work up an idea, which has been worked out by the unorganized inventor on paper, to a decent prototype and to turn it over to industry.

To Manage or to Correct?

The difference between these concepts, which are similar in sound, consists in the fact that the same thing happens in both cases. But in the former case in good time, while in the latter with a delay, when the matter has reached a deadlock and the only alternative is to correct the situation.

We have many inventions. But much here depends on what one counts and how. We will not argue, this is a theme for a separate discussion.
We have already spoken about the "stir" in our inventing system. But there is a reverse side of the coin: specialists claim that, by directing the efforts

of inventors at the improvement of existing equipment, we are preserving its inferiority. One should not brush this circumstance aside.

It is easy to be convinced of this on the basis of the examples of the Don-1500 combine, the ADM-8 milking unit, and even the passenger cars which are still just being readied for production. All these are modifications of equipment, which was assimilated long ago--with more or less significant improvements, but they are not drawing up to the world level. And, apparently, they will not be able to achieve it in the future, since the lag in the technical level extends not only to the finished product, but also to the scientific and technical reserves which form it.

In other words, the lag of the mentioned objects of equipment was a consequence of the fact that the inventions implemented in them were lower than the ones which foreign firms have for the updating of their products. Therefore, it is also hardly worth connecting the technical and economic importance of an invention further with the known prototype. A thorough functional analysis against the background of the scientific and technical reserves of the leading firms of the world and an orientation toward the real needs of specific users and toward the entire set of criteria, which were reflected in the publication "Information on Machines Which Do Not Yet Exist" (see NTR, No 10, 1986, pp 4-5), are needed here.

It must be said that about 20 years ago they began to deal with the development of methods of such an analysis at the Poisk Scientific Production Association of the State Committee for Inventions and Discoveries. From the start they did not obtain impressive results. They terminated the theme as unpromising. Today everything is being developed all over again. For example, an analysis of inventing activity in its most important directions in our country and abroad during 1984 was made. They sent the results of the analysis in tables and graphs to the ministries. And they received responses: "It is interesting and can serve for the making of management decisions, give us more, more quickly, closer to the sector...."

Not more than an hour, apparently, is needed for drawing up such responses. In several departments they did it even more simply: they stated the content of the first five pages of the received document and in this way drew up in response one page of their own. And only in Belorussia did they decide to deal with the matter: together with the institute to study the priority directions of the development of technology of the region for the future. Thus, for the present the inertia of formal replies is still strong....

The All-Union Center of Patent Services on the instructions of the State Committee for Inventions and Discoveries not that long ago checked the technical level of 85 agricultural machines. And it turned out that for a third of the items, which had been proposed for assimilation, the technical and economic indicators proved to be much lower than those of foreign analogues. They informed the USSR State Committee for Science and Technology and the USSR State Planning Committee in good time about this. But the majority of the checked innovations had already gotten into the sectorial plans and the State Plan.

Years will pass before it will be possible to correct the situation. But the strangest thing, perhaps, lies in something else: no one is responsible for this. The State Planning Committee does not evaluate the technical level, the State Committee for Science and Technology should, but...it lost the corresponding document. And it is not surprising: it was simply necessary, from the standpoint of specific interests, to lose it.

A question involuntarily arises. The All-Union Center of Patent Services is developing a method of the determination of the technical level and even the forecasting of the development of equipment for the future. The best foreign analogues are well known, it is possible to determine the portfolio of scientific and technical reserves from patent documents.

It is more difficult with questions of the analysis of market conditions. It concerns another department. But if desired it is possible to find some version of the solution of the problem. It is possible to give the developers guidelines. But only whoever wants to can see them and, what is the main thing, use them. Will not the efforts of thousands of specialists come to nothing like the document on the technical level of agricultural machines?

They might come to nothing. For in addition to the syndrome of mimicry and inferiority the attraction of large figures and the aspiration to reduce one and all to the same level are very widespread. And here to do it so that the wolves would be well-fed and the sheep would be safe, which in practice, as is known, is unattainable.

The economic impact from the sale of an invention is calculated, he, for whom it is profitable to inflate the corresponding indicator, issues it. Prior to planning at all stages of the life cycle of a new item it is necessary to conduct patent research. Such a thing is being done, but with the aim not to slow down planning, on the one hand, and to show what is necessary, on the other. The matter has been farmed out to the managers of scientific research institutes and design bureaus. They have, as a rule, small patent collections. Information on foreign developments and prototypes at times is available, but if they get in the way of their own, they set them aside. And everything is all right.

But, in general, is it necessary to bring forth so many instructions, statutes, and explanations, if they do not stand the test of time? Is it worth evading an elementary truth: people will act not as someone wants them to (they can and do act that way in exceptional cases), but as is characteristic of them to behave, in pursuing their own interests.

Consequently, it is necessary to specify only the priority guidelines of the interaction of man and society. Then personal interest, which coincides with the interests of the state, should function. But why, indeed, was an entire set of statutes and instructions, which makes it possible to force the inventor to camp on the doorstep of ministries, departments, and courts, created? Do we really not need his creative efforts, has he really not earned a reward?

The Institute of Electric Welding imeni Ye.O. Paton, the All-Union Scientific Research, Planning, and Design Institute of Metallurgical Machine Building, the Institute of Eye Microsurgery, and the Kurgan Institute of Orthopedics and Traumatology are operating at the world level also not last of all owing to the fact that they know this level well, while relying on their own extensive foreign contacts. Now this level is becoming accessible to all. The decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Radical Increase of Product Quality" envisages the development in the country of an effective system, which provides developers with the necessary information on the latest achievements and trends of the development of domestic and foreign science and technology. But much will also be expected from him, to whom much has been given!

Our scientific and technical potential is large. In essence, whichever sector you take, there are sound proposals and, in many cases, pilot-scale plants and technologies, which increase labor productivity by three- to tenfold and decrease the power-output and materials-output ratios to one-half to two-thirds. There are reserves in the field of plasma technologies, molecular biology, and composite materials. It is necessary merely to change fundamentally the system of the advance of technical solutions into practice at large. The key to the solution of the problems of the acceleration of the socioeconomic development of the country and the increase of the competitive ability of Soviet products on the world market lies in this.

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TASKS OF INTERDEPARTMENTAL COORDINATING COUNCIL OUTLINED

Leningrad LENINGRADSKAYA PRAVDA in Russian 5 Jul 86 p 2

[Interview with Doctor of Technical Sciences Yu.P. Yelovskikh, chief scientific secretary of the Interdepartmental Coordinating Council of the USSR Academy of Sciences, by S. Samoylis under the rubric "Science: From the Design to the Object": "The Shortening of the Distance"; date, place, and occasion not given; first three paragraphs are LENINGRADSKAYA PRAVDA introduction]

[Text] "Increase the responsibility of scientific organizations for the level of research and development, for their most complete use," it is recorded in the decisions of the 27th CPSU Congress. The academic and sectorial institutes, design bureaus, and higher educational institutions of Leningrad have now actively joined in the accomplishment of this program task. But, perhaps, the Interdepartmental Coordinating Council of the USSR Academy of Sciences (MKS)--a unique scientific formation, which was established in Leningrad 6 years ago and to this day remains the only one in the country--is called upon to play a special role in its fulfillment.

Within it there are 16 scientific councils, which are responsible for the elaboration of the most urgent directions of scientific and technical progress for Leningrad and the northwest region of the country. Scientists, managers of the largest enterprises, and workers of party and soviet organs belong to each council. About 400 prominent scientists are members of the Interdepartmental Coordinating Council.

What problems is the Interdepartmental Coordinating Council working on today? The interview with Doctor of Technical Sciences Yu.P. Yelovskikh, chief scientific secretary of the council, began with this question.

[Answer] The strengthening of the cooperation of scientific research at academic and sectorial institutes and higher educational institutions and the tending of the passage of innovations over the entire distance: from the idea to introduction, were and remain the main thing in our work.

It is now already possible to say that we have succeeded in developing a sufficiently reliable mechanism for the carrying out of this work. It is possible to divide the activity of each council conditionally into three

directions--the planning, scientific, and monitoring directions. It is possible to judge how they are being implemented from a specific example.

The Scientific Council for the Chemical Sciences drew up the coordinating plan "The Development of New Silica and Refractory Materials for Construction and Power Engineering." The development of a fundamentally new class of organosilicate materials, which can also be used as coatings which are weatherproof, became one of the items of the plan. The participants in the development of the innovation and the times of its transfer from one performer to another are indicated in the plan.

The first link in this chain is basic research at the Institute of Silicate Chemistry of the USSR Academy of Sciences. Then they transferred the development to the construction laboratory of the Main Administration of the Construction Materials and Components Industry of the Leningrad City Soviet Executive Committee, where the optimum conditions for the production of the innovation had been developed. On the final lap the Pobeda Association, which set up the mass production of the coating on the basis of new organosilicate materials, took this baton.

I will note that all the collectives, which are responsible for the fulfillment of this item of the coordinating plan, are represented in the Scientific Council for the Chemical Sciences. Therefore, the monitoring of the passage of the theme and the times of the fulfillment of its stages was without any exaggeration of a daily nature. As work progresses an analysis of the obtained results is made and the necessary advice on some scientific questions or others is given. As a result the gap between the completion of research at one scientific institution and its continuation at another is reduced to a minimum. While this has a substantial influence on the speeding up of the introduction of an innovation.

[Question] The Interdepartmental Coordinating Council already has a considerable "length" of service. Have bottlenecks in its activity appeared during these years?

[Answer] Problems, of course, do exist. At the level of theoretical developments appreciable irregularities are not occurring, but it is with introduction that serious difficulties occur at times. We developed, for example, an advanced method of determining the efficiency of lubricating oils in various machines and mechanisms. It was tested at several Leningrad enterprises. Excellent results were obtained: for example, the life of scarce lubricating oils was increased from 150-300 to 2,000 and more motor hours, a significant saving of oils was obtained. After this the Interdepartmental Coordinating Council addressed to the largest motor transport organization of the city, the Main Administration of Motor Transport of the Leningrad City Soviet Executive Committee, a proposal on introduction. And what of it? Nearly 1.5 years passed, but the method, which promises with the minimum expenditures a significant economic impact, was never introduced.

[Question] What reasons do the executives of the Main Administration of Motor Transport of the Leningrad City Soviet Executive Committee cite?

[Answer] There are no fundamental objections. But they argue as follows: we lived without this method earlier, we will live now as well. The matter is coming to a standstill due to the slow psychological change of individual executives and the lack of interest of production workers in the introduction of what is new. This, unfortunately, concerns not only the cited example. From the platform of the 27th CPSU Congress it was stated that today the turn of not only science toward the needs of the national economy, but also production toward science is important. In practice this party requirement for the present is not always being fulfilled.

[Question] Can the Interdepartmental Coordinating Council force an innovation to be introduced?

[Answer] It is a difficult question. On the one hand, our proposals on introduction do not have the force of law and are only of a recommendatory nature. But, of course, certain levers, by means of which we can speed up introduction, exist.

One such lever is closer cooperation with ministries and departments. We quite often turn there on questions of the introduction of our developments, but, it must be confessed, we do not always obtain the desired result. The reasons, for which they frequently refuse us assistance, are most different: there are no idle capacities, there are not enough assets, there is no opportunity to carry out construction work (at times the introduction of an innovation supposes the expansion of production areas), and so forth. Here is a graphic example. We addressed to the Ministry of the Machine Tool Building Industry a request on the renovation of the Instrument Plant. It is planned to establish at it a works for the conversion of metal chips into powder and further into powdered metals. In collaboration with the Scientific Council for Powder Metallurgy and Composite Materials, the Lengiprostanok [Leningrad Machine Tool Design Institute] began the drafting of a plan of renovation. But now the matter has come to a halt: there are no assets, they replied at the ministry. But the development of powder metallurgy is acquiring today greater and greater importance!

These are difficulties of an objective nature. But there are also such problems which are arising through our fault. Scientific development is carried out at times without a goal orientation toward specific introduction. The Interdepartmental Coordinating Council cannot always find in the Northwestern Economic Region the enterprise or organization, which by the nature of its activity can introduce an innovation.

The covering of the distance from the idea to introduction is being slowed down due to the extremely weak pilot production base of the majority of academic institutes. I do not mean to say that they need the same kind of pilot base as sectorial scientific research institutes have. Still the solution of the fundamental problems of science is the basic task of academic institutes. But frequently they do not have a pilot base at all! Today the question of the harmonious combination of basic research and applied development, which has a practical outlet into the national economy, is arising. But the institutes of the USSR Academy of Sciences at times do not have the opportunity to carry out the testing of their own development.

[Question] How has the work of the council been reorganized since the 27th CPSU Congress. Which questions are now most urgent?

[Answer] At the congress it was emphasized that for the successful introduction of an innovation the developers should ensure its maximum completion. Unfortunately, at a large number of our scientific research institutes and higher educational institutions they cannot accomplish this task due to the constant shortage of the latest instruments and advanced equipment. As a consequence, research is being dragged out, introduction is being postponed.... Now we are performing serious work on correcting such a situation. The Scientific Council for Instrument Making engaged in the establishment of intersectorial collective centers of the use of scientific instruments, in particular, on the basis of the Burevestnik Scientific Production Association. We hope that such centers will make it possible to increase the efficiency of the use of instruments.

We are now devoting more attention to the organizational aspect of the work on the shortening of the distance from the idea to introduction. The demands on coordinating plans, for example, have become much more strict: every development today should be aimed at specific introduction. If an innovation for some reasons cannot be introduced in the northwest region, the scientific council should seek opportunities for its introduction in other regions of the country. With our participation the Leningrad Scientific Center set up a special commission for introduction, which is tending developments in the area of medicine and agriculture. But for the present this is the beginning.

Now the question of the expansion and development of the pilot base, first of all of academic institutes, is being worked on. We are enlisting the production capacities of sectorial scientific research institutes and enterprises.

In short, all efforts are subordinate to one goal--the improvement of the mechanism of the interaction of science with production.

7807
CSO: 1814/1

DECREE CRITICIZES WORK OF SECTORIAL RESEARCH, DESIGN ORGANS

Moscow EKONOMICHESKAYA GAZETA in Russian No 27, Jul 86 p 3

[Article: "In the USSR Council of Ministers"; first paragraph is EKONOMICHESKAYA GAZETA introduction]

[Text] At the 27th party congress and the June (1986) CPSU Central Committee Plenum particular attention was directed to the need for the substantial improvement of the work of sectorial science. The USSR Council of Ministers adopted the decree "On Serious Shortcomings in the Activity of Several Sectorial Scientific Research and Planning and Design Organizations."

In the decree it is noted that in the implementation of the policy of the acceleration of the socioeconomic development of the country, which was approved by the 27th CPSU Congress, an important role belongs to sectorial scientific research and planning and design organizations. The task is to increase substantially their contribution to scientific and technical progress, the renovation and retooling of the national economy, the development of new types of high-performance equipment, advanced technologies, and materials, and the increase of product quality. The work of these organizations should be brought closer to the needs of production.

The USSR Council of Ministers emphasized that sectorial science has a developed network of scientific research institutes and design bureaus. Large scientific forces and much equipment are concentrated at them, and wherever they are used skillfully, high results are achieved.

At the same time it is indicated in the decree that the activity of a number of sectorial scientific research and design organizations is inefficient, is not of a creative nature, and does not have an appreciable influence on the increase of the technical level of production. The dispersal of assets and forces is being allowed, operations, which are of neither scientific nor practical value, are being performed.

In the decree it is indicated that ministries and departments are slowly reorganizing their work on the improvement of the management of sectorial science in conformity with the decisions of the 27th CPSU Congress. The necessary monitoring of the activity of scientific research and planning and design organizations is not being implemented. They are frequently kept busy

with the drawing up of various kinds of certificates and reports. Several of them have in essence turned into an appendage of the central staff of ministries and departments. This is one of the basic causes of the extremely unsatisfactory use of the scientific and technical potential of the indicated organizations. The fact that individual executives of ministries approach in a noncritical manner the state of affairs at subordinate scientific research institutes and design bureaus and underestimate the importance of the quickest reorganization of their work for the purpose of the radical acceleration of scientific and technical progress, arouses particular anxiety.

As the check made by the USSR State Committee for Science and Technology and the USSR Committee of People's Control showed, such institutes as the VNIIkomplekt (All-Union Scientific Research, Planning, and Design Institute for Complete Technological Lines) of the Ministry of Chemical and Petroleum Machine Building, the GiproNIImash [State Scientific Research Design Institute for Machine-Building] of the Ministry of the Machine Tool and Tool Building Industry, the VNIIkompozit of the Norplast Association of the State Committee for Hydrometeorology and Environmental Control, the Dzhezkazan Scientific Research and Planning Institute of Nonferrous Metallurgy Enterprises of the Kazakh SSR Ministry of Nonferrous Metallurgy, and the Scientific Research and Planning Institute of Automated Control Systems of Common Carrier Motor Transport of the RSFSR Ministry of Motor Transport are not making the proper contribution to the development of science and technology. The work of these institutes proved to be unfruitful scientifically and does not meet the present requirements of scientific and technical progress.

The USSR Council of Ministers made the decision on the elimination of the VNIIkomplekt of the Ministry of Chemical and Petroleum Machine Building and the GiproNIImash of the Ministry of the Machine Tool and Tool Building Industry with the placement of the workers in jobs in accordance with established procedure.

Thus, the VNIIkomplekt, which was established in 1974 and has 320 staff members, in practice is not performing the functions of either a scientific or a planning and design organization. At it not one development has been created at the level of inventions, the research being conducted duplicates the themes of other institutes. Many management personnel are not displaying the proper responsibility for the assigned job and systematically allow upward distortions in state reporting. With the connivance of the ministry the number of highly paid personnel was artificially overstated at this organization: there are 176 managers of various levels for 71 rank and file staff members, moreover, only 13 people have an academic degree (of candidate of sciences).

The GiproNIImash of the Ministry of the Machine Tool and Tool Building Industry, which has about 1,000 staff members, is working entirely unsatisfactorily. The indicated institute is not performing the functions of the main organization in the sector, which have been assigned to it. Its scientific activity is aimed at the solution of narrow departmental problems without regard for the needs of the machine building complex as a whole. The plan of work of the institute is overloaded with special, secondary themes, many of which are repeated from year to year, and only a negligible number of

them are promising and patentable. In the developments of this organization there is no orientation toward the use of resource-saving technology and the complete mechanization and automation of production. The economic impact of the work of this institute is very small.

In the decree it is emphasized that to a significant extent the identified shortcomings are a consequence of the intolerably poor work of the named ministries and departments with the entrusted institutes. The attention of Minister of the Machine Tool and Tool Building Industry Comrade B.V. Balmont and First Deputy Minister of Chemical and Petroleum Machine Building Comrade A.G. Rutskiy was directed to the management of the indicated institutes on the part of the ministries, which has been unsatisfactory for a number of years, and to the taking of the necessary steps on the increase of the efficiency of their activity. USSR Ministers Comrades Balmont and Lukyanenko were obliged to examine the question of the personal responsibility of the officials who are to blame for this.

The corresponding USSR ministries and departments and councils of ministers of the union republics were ordered to reorganize radically the work of other scientific research institutes and design bureaus, at which during the examination of this question serious shortcomings were identified.

The USSR Council of Ministers obliged the executives of all ministries and departments to analyze thoroughly the activity of sectorial scientific research and planning and design organizations, to ensure the decisive improvement of their work in conformity with the present requirements of scientific and technical progress, and to increase the responsibility for the level and efficiency of research and development, as well as for the introduction of their results in practice.

7807
CSO: 1814/234

COMPUTERIZATION OF EDUCATION, COMPUTER TRAINING IN MOLDAVIA

Kishinev KOMMUNIST MOLDAVII in Russian No 6, Jun 86 pp 49-54

[Article by Moldavian SSR Deputy Minister of Higher and Secondary Specialized Education I. Sandu: "Timely Training for Personnel"]

[Text] The changeover of production to the path of intensification, the acceleration of scientific and technical progress, and the improvement of the economic mechanism are the most important tasks of the Soviet people at the present stage. As is known, the productive forces of socialist society have entered an exceptionally important, qualitatively new stage of their development, which is connected with the all-encompassing process of the introduction and fundamental use of the achievements of scientific and technical progress. While examining the basic directions of party economic policy, the 27th CPSU Congress attached paramount importance to the rapid updating of the production system by the extensive introduction of advanced equipment, advanced technological processes, and flexible systems, which make it possible to change over promptly to the output of new products and yield the greatest economic and social impact. The transformation of productive forces and the improvement on their basis of production relations determine the essence, the main content of all our activity at the present stage. In its novelty and complexity this is a problem of enormous scale and revolutionizing influence. "It is necessary," it is noted in the new version of the CPSU Program, "to complete overall mechanization in all the sectors of the production and nonproduction spheres and to take a big step in the automation of production with the changeover to automated shops and enterprises, automated control systems, and computer-aided design systems."

One of the main directions of scientific and technical progress today is computerization, that is, the saturation of production, means of transportation and communications, the sphere of management, science, education, and daily life with various computer devices. At the conference in the CPSU Central Committee on questions of the acceleration of scientific and technical progress Comrade M.S. Gorbachev called microelectronics, computer technology and instrument making, the entire information science industry "the catalyst of modern scientific and technical progress." The development and introduction on their basis in the national economy of the country of machines and equipment of new generations, which are capable of yielding a multiple increase of labor productivity, flexible machine systems (GPS), and computer-

aided design systems (SAPR) are, as was noted at the conference in the CPSU Central Committee, a task of particular importance. In the accomplishment of this task a large place is being assigned to the higher and secondary specialized school. In conformity with the statewide program of the creation, the development of the production, and the efficient use of computer technology and automated systems for the period to 2000 it is called upon to implement urgent measures on the significant improvement of the training and advanced training of specialists in the field of computer technology. It is beyond all question that it is necessary to carry out on a broad front the training of personnel for the national economy of the country in the area of computer and microprocessor technology, moreover, practically all workers, school children, and students should master it. It is already well known that the ability to work at a computer will soon become the same kind of necessity as the ability to read and write is today. Precisely for this reason the study of computer technology should begin already at secondary educational institutions--schools, vocational and technical schools, and tekhnikums, and then be continued at higher educational institutions.

The school should assimilate the computer as a subject and as a means of instruction and make it the first used machine and programming--the second competence. Academician of the USSR Academy of Sciences A.P. Yershov, while examining the methodological aspects of the introduction of computer technology, indicated the following ones. The computer is not simply another technical means of instruction, but a partner of man for his entire life. One must not work with a computer as a "black box," regardless of the age of the child the computer should afford him the possibility of creative activity and the realization of initiative. The work with a computer should be mainly individual, with the exception of those instances when group activity is educationally justified or economically substantiated. Everyone, who graduates from a secondary school, a vocational and technical school, or a tekhnikum, should master the hardware and be able to program in one of the languages. The stages of the accomplishment of this task are the cultivation of the aptitude for interaction with the computer. The pupil at the age of 7 to 10 years learns to work with the computer, combinatorial thinking is developed in him. During this period he should master symbolic notation and be able to form a structure of actions and to organize the data necessary for this. At the age of 11 to 14 he should use the computer and apply it for his own purposes, while at the age of 15-17 he should be ready to use the computer in professional activity. The means of implementing this program are incorporated in the reform of the general educational and vocational school. The adopted decree of the CPSU Central Committee and the USSR Council of Ministers "On Measures on the Assurance of the Computer Literacy of Students of Secondary Educational Institutions and the Extensive Introduction of Electronic Computer Technology in the Educational Process" made it incumbent to introduce, starting with the 1985/86 school year, at all secondary educational institutions of the country the new course on the principles of information science and computer technology. This year at the general educational school the ninth grade students have begun to study it.

Of course, before starting such instruction, well-trained specialists should be available. For this purpose the advanced course training of more than 1,000 teachers and instructors of mathematics and physics of secondary general

educational schools, tekhnikums, and vocational and technical schools was organized in July-August 1985 on the basis of Kishinev State University imeni V.I. Lenin and the Tiraspol Pedagogical Institute imeni T.G. Shevchenko and with the assistance of the republic InterVUZ Computer Center of the Moldavian SSR Ministry of Higher and Secondary Specialized Education. The course of instruction was designed for 72 hours, moreover, a portion of the time was envisaged for the completion of practical and laboratory lessons in the interactive mode at the console of a microcomputer. The teachers familiarized themselves with the design and operating principles of the computer, algorithms and means of their description, programming languages, computer software, the prospects of the development and use of electronic computer and microprocessor technology in the national economy, and the demands on the school educational study center for computer technology. The training of instructors and teachers for the conducting of the course in the principles of information science and computer technology will be continued. A similar 120-hour course has been given since 1985 to the graduates of the Physics and Mathematics Faculty of the Tiraspol Pedagogical Institute and the Faculty of Mathematics and Cybernetics of Kishinev University. The introduction of such a course should be regarded as the beginning of much practical organizing work on the realization of the requirements of the reform of the general educational school in the area of the assurance of the computer literacy of students. The subsequent influence of this process on the content and methods of instruction at not only the secondary, but also the higher school will be exceptionally great.

In a few years boys and girls, who have skills in the practical use of computer technology in solving various applied problems, will cross the threshold of the higher educational institute. This will mark a qualitatively new stage of the emergence of computer literacy. Therefore, one of the cardinal tasks facing the higher school is to ensure the interdependent development of the entire system of education and to achieve unity and continuity in matters of the introduction of computer and microprocessor technology in the educational process.

It is necessary to note that the higher educational institutions of the republic have already gained some experience in the use of computer technology in the educational process and scientific research. Thus, at Kishinev Polytechnical Institute imeni S. Lazo subjects, which are connected with the study of the principles of electronic computer technology, digital methods, and algorithmic languages of programming, have been taught for many years in the lower classes. The educational laboratory base of the chairs of computer technology, the designing and production of electronic equipment, automation, remote control, and control systems is furnished with modern control and measuring equipment and computer technology. Display classrooms have been established on the basis of minicomputers, automated workplaces (ARM) and computer-aided design systems (SAPR) are being used in the practical training of students.

The interVUZ scientific methods conference of professors and instructors on the theme "The Use of Minicomputers and Microcomputers in the Educational Process" and the review and competition of the work of chairs on the use of these machines, which were held in March of last year, convincingly showed

that positive changes in matters of the extensive introduction of computer technology in not only special, but also general scientific and general technical subjects had emerged at the higher educational institution. The number of graduation projects, which are performed with the use of computers, is increasing from year to year.

Staff members of the Chair of the Designing and Production of Electronic Equipment, of which Corresponding Member of the Moldavian SSR Academy of Sciences Professor I.F. Klistorin is in charge, within the framework of the union interVUZ scientific and technical program "Robots and Robotic Systems" developed analog-to-digital converters of the integral signatures of periodic signals and the ASKID-60 automated system of the monitoring and diagnosis of digital and microprocessor devices. These results were the basis for the TEST and IVA series-produced monitoring systems, which were developed at enterprises of the USSR Ministry of the Communications Equipment Industry and the USSR Ministry of the Radio Industry.

However, for many years the problem of the computerization of education was successfully worked on only for a limited group of specialties, and the pace of this work lagged behind the requirements of today. Today the higher school is faced with the task both of the training at a leading pace of specialists in new promising directions of science and technology and of the assurance of the computer literacy of students of all specialties.

The training of specialists in the field of the use of computer technology is formed of basic and specialized training. Basic training gives them the necessary information about computer technology and the skills of the preparation and use of programs for the solution of problems on a computer. Specialized training is aimed at the broadening of the knowledge and the strengthening of the skills of specialists in the field of microprocessor technology and the mastering of the methods and means of computer-aided designing, the control of production and technological processes, and the use of automated systems of scientific research.

The acceleration of scientific and technical progress is also advancing special demands on the training of engineers in the field of the use of computer and microprocessor technology, in connection with which Kishinev Polytechnical Institute, which has already gained some experience, has to solve many difficult problems in order to give modern enterprises competent personnel. In conformity with the assignments of the Comprehensive Program on the Training and Advanced Training of Personnel During the 12th Five-Year Plan in the Area of the Development, Production, and Operation of Robotic Complexes, Flexible Machine Systems, and Computer-Aided Design Systems the polytechnical institute during 1986-1990 should give the national economy of the republic 1,200 specialists, who have a thorough knowledge of and practical skills in work with devices and special equipment, which are equipped with computer hardware, microprocessors, and manipulators.

The instruction of students of natural science, engineering, and economic specialties, which involve the use of computer technology, should be carried out on the basis of continuous training, moreover, basic instruction should be carried out, as a rule, already during the first years of their training. The

extensive use of computers is envisaged during the performance of course and graduation designing and the educational research work of students.

Along with the subjects, which are contained in the curricula, higher educational institutions have been granted the right to introduce new elective courses, at the expense of the advising hours of the higher educational institution, and to change by up to 10 percent the scope of the subjects which are envisaged by the curriculum.

An effective means of intensifying the educational process in case of the study of programming languages and the principles of computer technology is the use of computer-based standard automated instruction systems (AOS). In this case the computer acts no longer as a subject of study, but as a means of instruction.

During 1982-1983 the AOS VUZ package of programs, the work on which among other higher educational institutions the staff members of the Chair of Algorithmic Languages and Programming of our university also performed under the supervision and with the participation of the Scientific Research Institute of Problems of the Higher School (NII VSh) and the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences, was developed. Undergraduates, students of tekhnikums and secondary general educational schools, instructors, operators, and systems programmers can use the AOS VUZ package. This makes it possible to conduct both individual and group educational lessons. Independent work in a dialogue (and this is especially important) of all the students in an individual mode on a practically unlimited number of educational subjects is ensured in all cases. At Kishinev University the KORKhIM, ANALIT, and KORKh automated educational courses in chemistry, the AFRODITA course for student mathematicians, and others have been successfully used for a number of years. The experience of the Chair of Germanic Languages of the university, at which instruction and control courses on the recognition and translation of various tenses of English verbs and on the development of the skills and ability of the use of all types of questions have been introduced, is arousing great interest among specialists. Systematic checking in the groups of students showed that the mastering of lexical and grammatical material is sped up by 1.5- to 2-fold. The Republic InterVUZ Computer Center, which is carrying out jointly with interested chairs the development and introduction of courses and is making computer time and display classrooms available for the conducting of lessons, is giving considerable assistance to higher educational institutions.

A peculiarity of automated instruction systems at the present stage consists in the fact that they are being developed and used within the framework of the traditional educational process. All types of educational lessons (except for lectures) and independent work of undergraduates can be conducted with the aid of an automated instruction system. This system can be used effectively for the organization of business (didactic) games and simulation not only in auditoriums, but also in laboratories, libraries, and others. Unfortunately, the instructors of higher educational institutions are still using timidly the possibilities of automated instruction for the intensification of the educational process. This, to a significant degree, explains the fact that of the 20 automated courses, which are available at the Republic InterVUZ

Computer Center, only one-third are being actively used in the educational process.

In the process of improving skills automated instruction systems make it possible to ensure the individual rapid advanced training of specialists with allowance made for the level of their knowledge. These systems are especially effective, as experience has shown, in case of the instruction of users of computers and automated control systems and programmers. It is very important that the AOS VUZ package can also be successfully used for the conducting of educational psychology experiments, the study of the educational process, as well as the formation of the data of the subsystems of automated control systems for higher educational institutions. For example, in 1985 the Republic InterVUZ Computer Center of the Moldavian SSR Ministry of Higher and Secondary Specialized Education acquired and modified for the conditions of the higher school the SAARS (system of the automated certification of managers and specialists) package of applied programs, which at present is being used as a subsystem of the operating "Kadry" automated system. The SAARS is being used for the conducting of the certification of staff members of various levels and instructors and for the obtaining of their "business portrait" with the aid of a computer. Great importance is being given to the development of modified versions of the AOS VUZ, which are oriented toward different advanced hardware and software, especially for minicomputers and microcomputers.

In fulfilling the instructions of the April (1984) CPSU Central Committee Plenum on the computerization of secondary education, the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences, Kishinev State University, and the Scientific Research Institute of Problems of the Higher School on the basis of the AOS VUZ package last year developed the AOS ShKOLA package of applied programs, which has already been introduced and is undergoing experimental checking at a number of general educational schools and vocational and technical schools of the country.

During the 12th Five-Year Plan the development and introduction of automated instruction systems in the educational process of subordinate higher educational institutions will be continued. A special section of automated instruction systems has been established within one of the scientific methods councils of the Moldavian SSR Ministry of Higher and Secondary Specialized Education.

The questions of the training and advanced training of teachers are acquiring particular importance in the solution of the problem of computerization. At present the process of introducing computer technology in the teaching of general science and specialized subjects is taking place extremely slowly. Many instructors do not have active skills in the use of computers, which is hindering the introduction in the educational process of plans and programs of the continuous training of students in the area of the use of computer technology, which are designed for the entire period of instruction. Due to this computers are being used inadequately in course and graduation designing.

In order to eliminate the emerged lag, the Moldavian SSR Ministry of Higher and Secondary Specialized Education took steps on the improvement of the skills of instructors of subordinate higher educational institutions in

computer and microprocessor technology. By the beginning of 1987 all of them will have taken the course of instruction. The acquired knowledge and skills will enable them to expand the use of computers in general science and specialized subjects and to create the necessary conditions for the successful solution of the problem of the computerization of education.

The higher school has another important task--the advanced training of specialists of the national economy. In light of the requirements of the acceleration of scientific and technical progress the needs of the national economy for the advanced training of engineers in new promising directions of science and technology are increasing significantly. The republic Ministry of Higher and Secondary Specialized Education jointly with the Kishinev City Party Committee studied the need of enterprises for specialists in the area of the use of computer and microprocessor technology, robotic units, and computer-aided design systems. On 1 October 1985 a special faculty for the advanced training of personnel in two directions--"Microprocessor Systems" and "The Automation of Designing"--was opened at Kishinev Polytechnical Institute.

The higher school has entered a new stage of its development. The reform of higher education in conformity with the tasks of the acceleration of economic and social progress, which were posed by the 27th CPSU Congress, has to be ensured. The goal of such reform is the further improvement of the content and the increase of the quality of the educational and training process and the closer coordination of the system of the training and use of specialists with the rapidly changing needs of society. This task is difficult and its successful accomplishment in many respects depends on the degree of supply of higher educational institutions with instruments, equipment, and computer hardware. Today only 30 percent of the need of the educational process of the higher educational institutions of Moldavia for processor computer time and only 10 percent of the need for display time are being met by means of the available computers. At the same time the republic State Planning Committee and State Committee for Material and Technical Supply are reacting poorly to the needs of the higher and secondary specialized school, the pace of the supply by them of educational institutions with minicomputers, microcomputers, and specialized complexes of automated workplaces (ARM) does not satisfy the requirements of today. The leading industrial enterprises of the city and country, whose effective assistance in the increase of the quality of the training of specialists is very necessary, are hesitantly meeting the Moldavian SSR Ministry of Higher and Secondary Specialized Education halfway in the creation of a modern material and technical base.

In carrying out the process of the computerization of education, the higher school is attaining a new level of its development, when its role in scientific and technical progress is constantly increasing. In solving the basic problem of the training of personnel, it is directly participating in the updating of the material and technical base of production. The fulfillment of the decisions of the 27th CPSU Congress and the tasks, which have been posed for the party and the people by the new version of the Program of the Communist Party of the Soviet Union, will depend on how successfully

the higher school copes with the problems facing it of training specialists of the new type, who are capable of efficiently settling the questions of the acceleration of scientific and technical progress.

7807
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DEVELOPMENT, USE OF LASER EQUIPMENT IN FRG

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 13, 8-21 Jul 86 p 7

[Interview with Doctor E. Kreutz, scientific associate of the Institute of Laser Engineering of the Rhein-Westphalian Technical University (the FRG), by A. Kuznetsov under the rubric "New Technologies": "Lasers Have Priority"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] The report of Doctor E. Kreutz, a scientific associate of the Institute of Laser Engineering of the Rhein-Westphalian Technical University (the FRG), aroused considerable interest at the ISEM-8 Symposium.

[Question] Doctor Kreutz, tell me, please, about the nature of the work being performed at your institute.

[Answer] Our institute is engaging in basic research in the field of laser equipment and technology. If you want to use completely all the advantages of modern laser equipment, you need to know the subtle physical processes which occur in case of the interaction of radiation with matter. Only by having studied these physical processes is it possible to select the optimum laser system with respect to a specific problem. Without this it is impossible to achieve the reproducibility of the results and to obtain the high precision and quality of machining.

At the present symposium we presented the results of the latest research and acquainted people with new processes and methods in the area of the electrophysical methods of machining materials. It is important to compare all the present methods from the standpoint of their precision, speed, and efficiency, and the Moscow meeting is affording an excellent opportunity for this.

[Question] With what new results did you come to the symposium?

[Answer] Mainly these are the results of our basic work in four main directions: the study of the interaction of laser radiation with matter, the study of plasma which is induced by laser radiation, the calculation of heat fluxes in case of laser hardening, as well as questions of optical feedback. The already obtained results enabled us to engage in a search for new means of the hardening of surfaces and the transformation of materials--steels, alloys,

and composite materials. Whereas laser cutting and welding are already being used quite extensively, this direction in the machining of materials requires great scientific efforts, especially in the area of laser surface machining, hard-facing, and the laser deposition of substances.

[Question] Are you engaging only in the study of the physics of the interaction of radiation with matter or also in the development of new types of technological lasers?

[Answer] About 20 years ago our institute began work on the study of the physical processes of the interaction of laser radiation with matter. With the increase of our knowledge of these processes we were also able to engage in the development of laser technological processes. When designing a laser unit it is necessary to proceed from the task at hand and to take into account the physical processes which occur in case of its operation. Thus the work on the study of plasma, which has been induced by laser radiation, was begun several years ago. It showed, for example, that in case of laser drilling pulse irradiation in conformity with the relaxation parameters of the forming plasma is necessary, in other words, the laser should operate in a pulse mode with a frequency of 6-10 hertz. Therefore, now we are engaging at the laboratory precisely in the development of such a system.

[Question] What types of lasers, in your opinion, are most promising for technological units?

[Answer] Everything depends on the specific task and the material which you want to machine. Thus, at present only carbon dioxide lasers are suitable for the cutting and welding of steel specimens with a thickness of several millimeters. A neodymium glass laser will be best for the cutting of sheets with a thickness of up to 1 millimeter or the drilling of 1-millimeter holes. Finally, if parts measuring several microns are needed, one should use excimer or the same neodymium lasers. The mode of operation of the laser--continuous or pulse--should also be chosen subject to the specific task.

[Question] The laser machining of materials is a quite new direction in technology. How extensively is it being used today?

[Answer] About 7,000 laser technological units are now being used in the world at industrial enterprises. Their number is increasing annually by 20 percent. Several days ago I was at a conference in the United States. There they showed us the first laser welding unit, which operates on a flow line in the auto making industry. In short, the interest in laser technology is constantly increasing, just as the number of laser units being produced is also increasing.

[Question] But, as is known, laser equipment is significantly more expensive than traditional machine tools. Is this not an example of the shooting "at sparrows from a cannon"?

[Answer] Of course, laser equipment is now significantly more expensive than conventional equipment, but one should not worry particularly about this. Based on the specific task, in each case it is necessary to contrast the

traditional technology, as well as other methods, for example, machining with a water jet or electrotreatment, and to compare the results. Precisely the results, and not the cost of the technology. If a laser unit yields better results, precisely it should be chosen. Moreover, the production of a part on expensive equipment at times may prove to be more profitable than on inexpensive equipment. In short, it is necessary to choose between the cost and the required properties.

[Question] But is laser technology perhaps too expensive and not necessary precisely for the automotive industry?

[Answer] Oh, everything depends on the situation. For example, Volkswagen in the FRG has very large robotized complexes. They themselves develop and produce them. In such large automated systems the use of laser robots, which machine complex parts and surfaces, is not only justified, but also economically profitable.

[Question] What, in your opinion, should be done so that laser technology would begin to be used on a broader scale?

[Answer] It is necessary to work on making them competitive, having decreased the cost. More effective lasers of smaller size are needed. One of the problems connected with this is the lack of series-produced electronic power equipment for the pumping of lasers. However, I am confident that it will soon be solved. Much work is also being performed on the increase of the average power of excimer lasers, since the shortwave radiation of lasers is important for many industrial applications, particularly in microelectronics.

[Question] And the problems connected with the interaction of laser radiation with matter--have they been solved?

[Answer] For their most part, yes. I would say that 70-90 percent of them have been solved. The problem lies in another thing--by knowing these processes, to learn to match the parameters of laser radiation with the physical properties of the material being machined. It is necessary to choose these parameters for the machining of metals, dielectrics, semiconductors, new types of polymers, and ceramic materials. This is a task for the next 10-20 years.

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ELECTROPHYSICAL CHEMICAL, COMBINED METHODS OF MACHINING

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 13, 8-21 Jul 86 p 7

[Interview with Doctor of Technical Sciences Professor V. S. Belov, general director of the ENIMS Scientific Production Association, by NTR correspondent S. Vasilyev under the rubric "New Technologies": "The Impact of Electrophysical Chemical and Combined Methods"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] The development of machine building, instrument making, radioelectronics, and other sectors of industry today is inconceivable without electrophysical and combined (EFKhK) methods of machining. By means of them it is possible to machine metals, alloys, and composite materials, to produce parts of complex form, and to make the most precise holes. Such methods are highly economical, while the technological equipment is easily automated. Not by chance, therefore, did the International Symposium on Electric Methods of Machining, ISEM-8, which was recently held in Moscow, arouse so much interest. Scientists and engineers of the leading industrially developed countries took part in its work. The more than 40 papers, which were read at the symposium, were devoted both to studies of physical chemical processes of the machining of various materials and to questions of automation and the use of automated computer systems and adaptive control systems. A significant portion of the papers at the symposium were given by specialists of the Experimental Scientific Research Institute of Metal-Cutting Machine Tools (ENIMS), the main organization for electrophysical chemical and combined methods of machining in our country. At the request of NTR correspondent S. Vasilyev Doctor of Technical Sciences Professor V.S. Belov, general director of the ENIMS Scientific Production Association, tells about the possibilities of the new technologies and the problems which are hindering their more extensive use in the national economy.

[Answer] The electrophysical chemical and combined methods of machining underwent development in connection with the extensive use of items made of superstrength alloys and other materials, which lend themselves with difficulty to machining by traditional methods. The new methods are very efficient in case of the production of parts of complex form, as well as in those instances when the cutting tool (the milling cutter, drill, cutter, and others) cannot be brought directly to the surface being machined or the

dimensions of the necessary holes, cavities, and slots are so small that it is altogether impossible to produce a cutting tool for their machining.

The effectiveness of electrophysical chemical and combined methods is explained, first of all, by the high concentration of the energy being liberated in case of its feeding through a discharge channel (electroerosion machining), a light beam (laser machining), a plasma flow (plasma methods of machining), and an electron beam (electron-beam machining). Combined methods, for example, with the application of ultrasonic vibrations in case of the drilling and cutting of threads in viscous and extrastrong metals have also been developed; the machining of materials can also be combined with abrasive or diamond, electrochemical or electroerosion action, and so on. Today the electroerosion, laser, plasma, and electrochemical methods of machining have found the greatest use. Both general-purpose and special-purpose machine tools have been developed and are being series produced.

Tool works should change over from the use of individual machine tools to the development of automated sections and shops. Computers, which are provided with programs of the technological preparation of production, planning, and accounting, should control them.

A section of this type, which was put into operation at the Khabarovsk Plant of Dies and Molds in 1985, made it possible to increase the shift coefficient to 2.5 and the equipment utilization ratio to 0.88. Here one operator attends not less than six machine tools. The number of workers was reduced to less than one-half. While at the Cheboksary Electrical Equipment Plant a similar section made it possible--with the same number of personnel--to increase the output of dies by 2.5-fold.

Another example is from the field of laser technology. As is known, the use of laser machine tools for the machining of ruby bearings at plants of the watch industry increased labor productivity by tenfold. The entire technological process was radically reorganized, in this sector alone more than 1,000 female drill operators were freed due to the use of automatic laser machines.

Now the proportion of electrophysical chemical and combined methods in the machining of items made of high-temperature, fusible, and similar alloys comes to 15 percent, while those made of cermet, diamonds, ferrite, quartz, and semiconductors--10 percent.

I will note that the equipment for electrophysical chemical and combined methods blends well with various production lines. Flexible modules, which are equipped with microprocessor units and mechanisms of the automatic replacement of electrode tools, have been developed and are already being produced by our industry. It is possible to use them for contour machining and broaching, cutting, and other types of operations. Each such module yields an annual saving of 15,000 to 40,000 rubles. Soviet machine tools enjoy international recognition, while our licenses are being purchased by firms of France, Switzerland, and other countries. But, unfortunately, numerous flaws in workmanship frequently hinder the more extensive dissemination of new machine tools. I would call them trifles, if they were

not hampering--and at times very significantly--the updating of the stock of machine tools of our industry.

Here, for example, is the low quality of domestic wire--copper, brass, molybdenum, and others--which is used as a kind of cutting tool in electroerosion machine tools. The precision of its diameter, according to the all-union standard, should be held to 20 microns. Meanwhile for the best foreign analogues this precision is already an order of ten greater--to 2-3 microns, and the strength is appreciably greater.

Or let us take, for example, high-quality systems of the supply of working fluids. Special pumps (corrosion-resistant, with good filters, and so forth) are needed for them, but the Ministry of the Chemical Industry is not delivering them to us. Hence the deterioration of the technical characteristics of machine tools and the decrease of the reliability of equipment.

In order to meet the needs of production for electrophysical chemical equipment, a program of the improvement of electrophysical chemical and combined machine tools was formulated for the purpose of increasing their capacity by a minimum of twofold and increasing the precision, degree of automation, and reliability. It is necessary to modernize, redesign, and develop tens of models of machine tools and components for them, as well as to assimilate a number of new technological processes, including combined processes. It is proposed to establish in the electrical equipment, machine tool building, and other sectors of industry automated sections for the production of dies, molds, and other complex items in small series. For this the machine tools should be equipped with adaptive and program control. In short, much still has to be done.

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LENINGRAD INTENSIFICATION-90 TERRITORIAL-SECTORIAL PLAN

Moscow TRUD in Russian 25 May 86 p 2

[Article by Hero of Socialist Labor I. Glebov, chairman of the Presidium of the Leningrad Scientific Center of the USSR Academy of Sciences, under the rubric "On the Paths of Technical Progress" (Leningrad): "An Order More Efficiently"]

[Text] A powerful scientific production complex operates in Leningrad. And its efficiency is determined first of all by the degree of integration of science and production. Thus, as a result of the uniting of the efforts of more than 400 enterprises, scientific research institutes, design bureaus, and higher educational institutions many types of new high-quality equipment: high-speed turbines and "millionaire" generators, more than 100 FMS lines, sections, and shops, and hundreds of advanced industrial robots, have been developed in the past 2 years.

The requirement of the convergence of science and production has been dictated for a long time now by life itself and the pace of scientific and technical progress. What is the novelty of the realization of this requirement in our times?

As to Leningrad, it is necessary to speak first of all about the Intensification-90 Territorial-Sectorial Program. The careful analysis of all the possibilities of the region with respect to the use of the achievements of scientific and technical progress is at its basis. The program encompasses basic and applied research, industry, the agroindustrial complex, municipal services, transportation, communications, construction, and the training of personnel. It was submitted for approval to more than 100 union and republic ministries, the USSR State Planning Committee, the USSR State Committee for Science and Technology, and the USSR Academy of Sciences. Intensification-90, as is known, received the endorsement of the CPSU Central Committee.

Such a program is being formulated in our country for the first time, and, while setting as its goal the intensification of the economy of the region, it also simultaneously serves as a program of the integration of science and production. If we speak about novelty in this process, it should be noted that the changeover everywhere from the automation of individual workplaces to

the thorough automation of the entire "research--production" cycle is envisaged by the program.

The formation of a powerful automated scientific production complex is one of the chief tasks of Intensification-90.

We have been engaging in this from the very start of the implementation of the program. International experience shows that integrated automation increases production efficiency by approximately twofold as compared with the impact that is obtainable from the introduction of individual automation systems. That is why at the first stage of the implementation of the program we devoted particular attention to the establishment of information computer networks, both regional and local, and on their basis of automated systems: automated systems of scientific research, plant management automation systems and plant technical management automation systems, automated systems of planning, design, and technological operations, flexible machine systems of all levels.

The data processing and computing center of the Akademset was put into operation, which enabled more than 100 scientific organizations to give up their own computer systems and computer hardware. The impact from the operation of the Akademset during the short time of its operation has already amounted to approximately 18 million rubles. The use of the computer-aided design systems, which have been developed in the region, is increasing labor productivity by 2- to 2.5-fold and is providing an annual economic impact on the average of 0.5-1.5 million rubles per system. In the region 35 systems of computer-aided design and the technological preparation of production are already in operation.

The introduction at enterprises of a number of sectors of flexible machine complexes significantly surpassed the anticipated result. Thus, the installation of flexible machine complexes at a number of machine building enterprises led to a 12-percent increase of labor productivity instead of 6 percent according to the plan. Experience shows that the introduction of flexible machine systems in assembly yields a significant economic efficiency: not less than 4 rubles per invested ruble.

The introduction of what is new always entails a large number of problems. And they did not pass us by. We are, of course, eliminating many on our own. But hitches of another kind are especially annoying. Here, for example, in accordance with a decision of the USSR and RSFSR State Planning Committees the Iskra-226 microcomputer was specified as the base model for the automation of planning calculations. Leningrad organizations of the RSFSR State Planning Committee are equipped with such computers. At the same time the storage and processing of information at the regional level with respect to all the sections of Intensification-90 are being carried out by the main organization--the Lensistemotekhnika Association--on a general-purpose computer of the ES series. The software of this computer precludes its direct, so to speak, communication with the Iskra-226. Of course, it is possible to reorganize everything and to develop new program devices. But, one would like to know, for what and why? Was it not simpler for the planners to come to an agreement in good time on this question with our scientific center?

This is just one case which testifies that, in spite of getting agreement on the program of intensification with all the necessary instances, complete interaction still does not exist.

The lack of specialized works for the production of robots and microcomputers in the necessary quality is also a bottleneck. This question also awaits its settlement in the State Planning Committee of the country.

Today we also have the right to reproach several ministries which are not fulfilling their promises on the material and technical supply and organizational support of the program. Thus, the USSR Ministry of the Petroleum Refining and Petrochemical Industry so far has not settled the issue of the financing of work on the development of an automated system of primary petroleum refining at the Kirishinefteorgsintez Association. But such a system should be introduced already next year. The RSFSR Ministry of Communications is allocating too few assets for computer hardware to its enterprises, thereby threatening with upsetting a number of assignments of the Intensification-90 Program. But all this was agreed on in advanced with the ministries and was included in the plan. Where is the obligatoriness of ministerial executives?

It is very regrettable that many new promising developments for the present are not finding application in practice. A most effective express method of monitoring the efficiency of lubricating oil--a scarce and expensive product--was developed and introduced at the Leningrad Zvezda Production Association. In a year 300 tons of lubricants were saved. We promoted this innovation, but only...the Inturist garage adopted it.

Powder metallurgy and laser, electrophysical, and electrochemical methods of processing materials are being introduced inexcusably slowly in machine building.

When we speak about equipment, we often use the expression "an order higher." Thus, in light of the demands of the party congress on the increase of the efficiency of the economy all of us should work an order more efficiently and more obligingly. The accelerating process of the integration of science and production, when even negligible delays inevitably entail very appreciable material, as well as moral costs, also makes this incumbent upon us.

The experience of the Leningraders shows that great reserves exist in all the units of the "research--production" process. And here the achievement of greater mutual understanding between scientific and technical and economic services at all levels is very important. Experience convinces us that those who develop new machines far from always take into account the requirements of the economy. Those who plan production place the main emphasis on the pace and at times do not specify the means of achieving this pace--technical and technological.

The integration of science and production also requires precise coordination in the activity of scientific production complexes and economic planning institutions. It is important to ensure the extensive introduction of new

technological processes and equipment of new generations, to concentrate efforts on the priority directions, and to increase radically the level of management and organization. These reserves should be utilized fully for the acceleration of economic and social development on the basis of scientific and technical progress.

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RECEPTIVITY OF GEORGIAN INDUSTRY TO INNOVATIONS CRITICIZED

Tbilisi ZARYA VOSTOKA in Russian 4 Apr 86 p 2

[Interview with Corresponding Member of the Georgian SSR Academy of Sciences Leonid Nikolayevich Okley, first deputy chairman of the Georgian SSR State Committee for Science and Technology, and Otar Chigogidze, director of the Tbilisi Tsentrolit Plant, by ZARYA VOSTOKA correspondent Vakhtang Akhalaya under the rubric "The Plenum Criticized. What Will Be Done?": "To Face Science"; date, place, and occasion not given; first paragraph is ZARYA VOSTOKA introduction]

[Text] At the 2d Georgian CP Central Committee Plenum it was emphasized that under the conditions of acceleration the turn of production to face science and its maximum receptivity to scientific and technical achievements are important. The following fact was cited as evidence that this receptivity is obviously inadequate: last year 15 assignments on the development of science and technology, which directly influence the increase of labor productivity, were not fulfilled. Here is what Corresponding Member of the Georgian Academy of Sciences Leonid Okley, first deputy chairman of the Georgian SSR State Committee for Science and Technology, said in this regard in an interview with a ZARYA VOSTOKA correspondent:

[Answer] Among the unfulfilled assignments of the plan of the development of science and technology for the Georgian SSR during 1985 there are assignments of both the republic and the all-union level. In all 10 stages of all-union scientific and technical programs and 20 plan measures: 8 with respect to associations and enterprises of union subordination, 5 with respect to union republic ministries and departments, and 7 with respect to republic ministries and departments, were not fulfilled.

These are appreciable losses, in spite of the fact that in all last year 120 assignments and stages with respect to 38 all-union scientific and technical comprehensive goal programs and programs on the solution of the most important scientific and technical problems were fulfilled and 566 stages of operations on 32 republic programs were completed.

Among the "debtors" with respect to the development of science and technology are the Stankostroitel and Gruzselmash Associations, the Poti Plant of Control

Generators, the Tsnori Machinery Plant, and a number of others, at which the output is being slowly updated and does not satisfy the present requirements.

The level of the mechanization of labor is low at the Georgian Coal Production Association, at enterprises of the Ministry of the Chemical Industry and the Ministry of Mineral Fertilizer Production, and in construction and agricultural production. The Georgian Coal Production Association fulfilled only half of the measures on the extraction of coal from completely mechanized breakage faces and the performance of mining by heading machines. The Rustavi Khimvolokno Production Association did not fulfill the assignment on the production of synthetic fibers and threads. The production of about 90,000 tons of ammonium nitrate on the AS-72 high unit power plant at the Rustavi Azot Production Association was not ensured. In the republic Ministry of Local Industry, in which the nonfulfillment of the plan assignments on new equipment has been allowed from year to year, the fulfillment of four measures was not ensured, and so on.

The causes of such a situation are different. One of them is the inadequate attention of the executives of a number of ministries and economic managers to the problems of the reequipment of production and to the introduction of fundamentally new equipment and technology.

[Question] Leonid Nikolayevich, at the plenum it was indicated that such managers must not be given the opportunity to seek a "peaceful" life and to hold themselves aloof of what is new and advanced. At the 27th Georgian CP Congress a program for the five-year plan, which was formulated the day before by the State Committee for Science and Technology, the State Planning Committee, the State Committee for Construction Affairs, and the Academy of Sciences of the republic, on the elimination of the "bottlenecks," which limit the intensification of production, was approved. To what extent will its implementation contribute to the acceleration of the introduction of the achievements of science and technology in production?

[Answer] This program encompasses practically all the enterprises of the republic and includes more than 500 items on "bottlenecks." These stages have already been included in the annual plan of the development of science and technology. The implementation of the program will yield an economic impact of 250 million rubles with a payback period of 3 years. The implementation of the generalizing end results of the introduction of the achievements of science and technology--the economic efficiency, labor productivity, the decrease of the product cost, including the saving of material and energy resources--will be taken under special control. The ministries, departments, associations, and enterprises of the republic already from the beginning of the year should have included the stages of the program in the plan of new equipment and should have elaborated organizational and technical measures which ensure their fulfillment.

[Question] Thus, a barometer of the receptivity of production to scientific and technical achievements along with their introduction is their efficient use. But for the present this is also still a serious problem....

[Answer] The question of the efficient use of equipment, first of all the latest equipment, is acquiring particular importance in the implementation of the policy of the intensification of production. But, indeed, there are many cases when newly installed machine tools, machines, or else entire mechanized and automated lines, which embody the latest achievements of science and technology, operate at half capacity.

By 1 July of last year only 54.2 percent of the mechanized flow lines and 38.5 percent of the automated lines had achieved the rated capacity. In all 3 mechanized lines each at the Kaspi Plant of Construction Materials and the Gardabani Roofing Material Plant, 2 lines each at the Tbilisi Tsentrolit Plant and the Mtskheta Combine of Construction Materials, 1 line each at the Azot and Elektrovozostroitel Associations, and others were operated with a load of less than 50 percent. But the full utilization of such equipment is the most important reserve of the increase of labor productivity--a priority factor of intensification.

[Question] Otar Chigogidze, director of the Tbilisi Tsentrolit Plant, speaks about what will be done for the radical improvement of the formed situation at one of the indicated enterprises:

[Answer] The delay with the assimilation of two new mechanized lines--the molding line of housings and the key line of large rods--in the new shop of small and medium castings was connected with the dragging out of a large number of start-up, adjustment, and auxiliary operations. It must be said that the introduction of these lines is a component of renovation, which will turn our plant into a modern enterprise with electric induction furnaces. These furnaces, the obtaining of high quality pig iron in which is being developed jointly with scientists of the Institute of Metallurgy of the Georgian Academy of Sciences, in the future will provide products of any brand at the request of the client.

After the completion of the renovation the output of pig iron will increase at the plant by twofold and will come to 60,000 tons a year. As to the new lines, we have elaborated a set of organizational and technical measures on their setting up and maximum utilization by the end of this half of the year. The unloading bunkers, drums for the drying of sand, and so on have already been prepared. Our contacts with the Institute of Metallurgy will become even closer.

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SHYAULYAY HOUSE OF ENGINEERS

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 13, 8-21 Jul 86 pp 1, 6

[Article by O. Lebedeva under the rubric "The Institute of Man": "The House of Engineers"; first paragraph is NTR: PROBLEMY I RESHENIYA introduction]

[Text] This unusual professional club--a house of high mutual professional respect for 900 people, a fourth of the engineering corps of the city--has been operating for 8 years now in Shyaulyay (the Lithuanian SSR).

It so happened that R. Pikshris, the manager of a group of designers of personal computers of the section of computer technology, turned out to be the first person with whom I spoke within the walls of this house.

"In our house," he says, "there is a 'card file of ideas.' Approximately 500 measures, which, in the opinion of the members of the house it is desirable to implement, are usually recorded in it. For a long time there was among them: to equip the House of Engineers with personal computers (PEVM).

"And now the idea's time has come. We have already come to an agreement with the contractor enterprises and soon will set up personal computers in our large hall, in the educational classroom, in the recreation room, and even in the cafe--in all about 10 personal computers."

"In the cafe?"

"Yes, in the cafe!" My companion continued as if nothing had happened. "Even if the 'electronic cashier' will in the course of, say, a month simply keep track of the number of cups of coffee you have drunk and upon the achievement of a given number of rubles will remind you of this, it, I believe, justifies itself. If only for the reason that it will save the wage of a 'live cashier.' But the main thing is that computer literacy does not come through theory alone. It is necessary to get used to this world both before and after work!"

"With what assets will all this be done?"

"We have come to an agreement with two enterprises of the city on mutually advantageous cooperation: during nonworking time we are carrying out the

design developments they need, while they are delivering equipment to us. By the end of the year we will have the computers."

"From where does such confidence come?"

"We have confidence in our partners. Therefore, we are worrying only about our section of the work...."

The Shyaulyay House of Engineers is adjacent to the building of the city affiliate of the Lithuanian Scientific Research Institute of Scientific and Technical Information and Technical and Economic Research (LitNIINTI) attached to the Lithuanian SSR State Planning Committee. And this is not by chance. The first professional club of engineers in the country is a specialized subdivision of the institute, three staff members of which constantly deal with the organization of the work of the house.

In particular, the acceptance of new members has been assigned to the public council of the house: preference is given to authors of the most effective design and technological developments and, of course, to honored engineers of the republic. Yes, this honorary title, which exists far from everywhere, has been instituted in Lithuania. It is awarded by the republic Supreme Soviet. And, it must be said, it is valued no less than the title of honored actor or physician.

The council of the house is renewed every 3 years and is approved not only by an order of the Lithuanian Scientific Research Institute of Scientific and Technical Information and Technical and Economic Research, but also by a decree of the city soviet executive committee. The most competent engineers, directors, chief engineers, process engineers of enterprises, and so forth are on the council. This is a kind of "collective mind," which operates not only within the walls of the house, but also on the scale of all industry of the city and its municipal services, in short, all organizations and enterprises, at which there are engineering services.

The documents of the house are only three card files: information on the members, reports on past measures, their cost and return, as well as the already mentioned card file of ideas. Incidentally, the fate of these card files is predetermined: they are destined to "disappear" in the memory of the computer, which the House of Engineers intends to purchase in the near future for the analysis, forecasting, and planning of its life and work.

The house is small. There is a hall with 120 seats for lectures, concerts, and viewings of movies, an outdoor site for exhibition displays, which are accessible, incidentally, to all city residents. A comfortable rehearsal room, a cozy cafe, as well as a two-lane bowling alley. Professional artists are frequent guests at the house. But exhibitions of "its own" painters, sculptors, simply handicraftsmen, their children, and members of families are held here even more often. At the exhibitions it is also possible to see the results of engineering hobbies, such as the building of personal computers and the collection of radio and other old equipment.

"On what does the house stand? I would say 'on two whales'," Honored Engineer of the Lithuanian SSR R. Bruzgulis, chairman of the public council of the house and chief of the Production Administration of the Installation of Gas Services, reflects. "First, we are striving to increase the occupational skills of engineers. Second, to unite engineering and technical personnel according to the principle of interests, which are common in a specific group, and mutually complimentary competence. The latter is very important for the solution of urgent, including for the city, scientific and technical and, at times, social problems. Many of them under the formed conditions are insoluble within the framework of formal personnel structures.

"But since I have said 'and social,' logic itself united in the programs of the house the technical with the humanistic. This, I am convinced, is a magical combination. The social sensitivity of the engineer and immunity both to professional dissolution in some specialties and to corporate exclusiveness are smelted in it. Finally, the treatment of one's job not as employment, but as service to the people is stimulated.

"Conditions have arisen, under which the increase of skills has become an internal stimulus for a larger and larger group of specialists. Managers of enterprises and associations are taking at the house the course of the 2-year economics school 'The Management of Scientific and Technical Progress Under the Conditions of Developed Socialism.' The courses 'The Organization of Labor and Production Management' are at the service, for example, of chiefs of shops. Courses for training in the minimum requirements for a candidate degree in English and German and in philosophy also operate at the house.

"Joint engineering actions are also being implemented within the framework of the technical program. For example, we have made ourselves responsible for the solution of nontraditional, most often intersectorial problems, such as mechanization and automation, the machining and welding of metals, their protection against corrosion, and the use of computer technology. Competent specialists of various enterprises and organizations of the city are being enlisted in this. The most experienced engineers visit enterprises in order to advise colleagues on urgent problems of equipment and technology.

"The humanities program is being implemented only after work, usually on Thursdays. And only for members of the house and their families. Politics and law, history and natural science, literature and philosophy, medicine and painting, architecture and music, the theater and the cinema, the psychology of human relations.... In short, everything without which you will not completely stimulate the 'human factor.'

"In order to achieve this we are striving to develop the intellect of the engineer and his creative thinking and to broaden his outlook. We are also conducting a campaign against--let us face it--general educational semiliteracy, which is still making itself felt. We are inculcating a systems approach to the matter, which is common to all mankind.

"A heightened sense of a fundamental connection between technology and other areas of human creative activity arises in the direct contact with figures of science, culture, and art. A view of culture and art, which, if it is

possible to say it this way, is most social, forms in the engineer. And from a consumer of aesthetic treasures he becomes a participant in their creation."

V. Vingars, head of the House of Engineers, enters into the conversation, he is the director of the city affiliate of the Lithuanian Scientific Research Institute of Scientific and Technical Information and Technical and Economic Research.

"One of the vital natural needs of man is the craving for contact. Without this one cannot evaluate objectively one's own professional and social 'self' and cannot understand the degree of responsibility to other people. One cannot enrich someone and enrich oneself with nontraditional knowledge and experience."

My companion reminds me about the following fact, which has been established by specialists: a person obtains approximately two-thirds of the special information in the process of contact with colleagues, and only a third while alone with books and documents.

"But take, for example, creative discussions," he continues, "only they give rise to truly new ideas. I believe that precisely friendly contact is the most effective catalyst of progress. Only it can protect man from reticence and alienation and give him the necessary psychological and moral strength. All the same it is necessary to some degree to organize such contact, without belittling in the least its natural spontaneity and improvisational nature. In essence, our house is for this....

"But a plan arose 20 years ago, when they began to hold so-called Days of the Engineer in the city. Each of them is a major professional holiday, which is held under friendly informal conditions. It was then that the idea also originated--it would not be bad to associate this way all the time and, hence, to have our own club.

"Chairman of the City Soviet Executive Committee Candidate of Economic Sciences V. Kazanavichyus (he is now deputy chairman of the republic Council of Ministers) was the initiator of the establishment of the house. Candidate of Technical Sciences Yu. Zuyus, director of our institute, also supported the idea.

"Not a full 9 months passed from the first inspection of the building to the festive opening of the house. In all 20 construction and industrial organizations were enlisted in the renovation operations."

"When the conversation turns to some process, in which people participate and which eats up assets," I interrupt my companion, "it is customary to ask: What is its impact, first of all economic impact? So tell me, please, in your opinion, did the house justify itself?"

"Yes, unquestionably. But I will not quell your doubts with figures. We better speak about quality...."

"In what sense?"

"In the literal sense. It is well known that in recent times the intensity of the competitions for admission to technical higher educational institutions, the professional activity and prestige of engineers, whose work from time to time dissolves in outside jobs, have been decreasing. The tearing of people away from engineering is increasing.

"But in Shyaulyay everything is happening the other way round: owing to our house the attraction of engineering, I would venture to say so, is increasing. We have afforded any rank and file specialist, if he is an engineer, even a young one, the possibility of informal creative contacts with the managers of his and other enterprises and engineering services."

"Tell me, when and how many times would a rank and file specialist get such an opportunity in ordinary service life?"

"Here it is once a week.

"The prestige of an engineer precisely as an engineer increases because of this. The managers have at hand a particularly strong intellectual reserve which, in our conviction, is appreciably accelerating scientific and technical progress itself.

"But do not think that I have evaded your economic question. The expenditures on the house, of course, are also being offset in this respect. And first of all by the intensification of creative engineering work. It has intruded upon the hours of leisure, from which it carries over inspiration and heuristic activity to the professional work of engineers, appreciably increasing its efficiency."

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AWARDS AND PRIZES

LITHUANIAN SSR STATE PRIZES IN SCIENCE, TECHNOLOGY FOR 1986

Vilnius SOVETSKAYA LITVA in Russian 20 Jul 86 pp 1, 3

[Article under the rubric "In the Lithuanian CP Central Committee and the Lithuanian SSR Council of Ministers": "On the Awarding of the 1986 Lithuanian SSR State Prizes in Science, Technology, Literature, Art, and Architecture"]

[Excerpt] The Lithuanian CP Central Committee and the Lithuanian SSR Council of Ministers, having considered the representations of the Committee for Lithuanian SSR State Prizes in Science and Technology and the Committee for Lithuanian SSR State Prizes in Literature, Art, and Architecture, resolved to award the 1986 Lithuanian SSR State Prizes to:

In Science and Technology

Doctor of Physical Mathematical Sciences R. Brazis, director of the Laboratory of Plasma Phenomena of the Institute of Semiconductor Physics of the Lithuanian SSR Academy of Sciences; Doctor of Physical Mathematical Sciences Professor Y. Grigas, scientific supervisor of the Laboratory of Microwave Spectroscopy of Ferroelectrics and Electrodynamics of the Physics Faculty of Vilnius State University imeni V. Kapsukas; Doctor of Physical Mathematical Sciences R.-A. Tolutis, director of the Sector of Magnetoplasma of the Institute of Semiconductor Physics of the Lithuanian SSR Academy of Sciences--for the series of works "High Frequency Plasma and Ferromagnetic Phenomena in Crystals" (1973-1985).

Doctor of Chemical Sciences Professor B. Yuodka, head of the Chair of Biochemistry and Biophysics of Vilnius State University imeni V. Kapsukas--for the series of works "Covalent Nuclein-Protein Structures and Their Chemical Modeling" (1968-1985).

Doctor of Technical Sciences Professor R. Bansyavichyus, head of the Chair of Technology of Machine Building of Kaunas Polytechnical Institute imeni Antanas Snechkus; Doctor of Technical Sciences P. Vasilyev, head of a department of the Vilnius Department of the All-Union Scientific Research, Planning, Design, and Technological Institute of Small Electric Machines; Doctor of Technical Sciences R. Kurilo, head of the Chair for Labor Safety Procedures and Environmental Protection of Kaunas Polytechnical Institute imeni Antanas Snechkus; Doctor of Technical Sciences Professor K. Ragulskis, scientific

supervisor of the Vibrotekhnika Scientific and Technical Association of this institute; Doctor of Technical Sciences I. Skuchas, professor of the Chair of Machine Tools of this institute--for the work "Vibratory Motors--Theory, Designs, Application" (1977-1985).

Y. Antulis, deputy chief process engineer of the Vilnius Plant of Drills; Candidate of Technical Sciences S. Buynyavichyus, chief of a design bureau of the department of the chief designer of this plant; Candidate of Technical Sciences A. Zhvirblis, acting docent of the Institute of the Increase of the Skills of Specialists of the Lithuanian SSR National Economy; Candidate of Technical Sciences V. Zhilis, chief of the base laboratory for state tests of drills of the Vilnius Plant of Drills; V. Rukshenas, chief economist and chief of the economic planning department of this plant; Y. Rutkauskas, chief of a technological bureau of this plant; Yu. Sirvidis, deputy chief power engineer of this plant; T. Tukay, leader of a multiple-skill brigade of this plant; E. Yurksha, chief engineer of this plant--for the development, study, and introduction of a set of high-performance equipment and designs of precision drills for the drilling of materials which are hard to machine (1975-1985).

Doctor of Biological Sciences O. Atlavinite, senior scientific associate of the Institute of Zoology and Parasitology of the Lithuanian SSR Academy of Sciences; Doctor of Biological Sciences A. Lugauskas, senior scientific associate of the Institute of Botany of the Lithuanian SSR Academy of Sciences; Doctor of Biological Sciences I. Eytminavichyute, director of the Laboratory of Soil Zoology of the Institute of Zoology and Parasitology of the Lithuanian SSR Academy of Sciences--for the series of works "Complexes of Soil Invertebrates and Micromycetes and Their Influence on the Fertility and Biological Activity of Soil" (1957-1985).

Candidate of Agricultural Sciences V. Buyvidas, chief of the Department of Selection and Genetics of the Baltic Zonal Experimental Station for Poultry Breeding; A.-F. Vayshvile, director of the trust of poultry breeding of the Lithuanian SSR State Agroindustrial Committee; Candidate of Agricultural Sciences S. Danyus, chief livestock expert of the Vilnius Poultry Plant; G.-M. Daunis, chief engineer of the Kayshyadoris Poultry Plant; Candidate of Biological Sciences Yu. Katkyavichyus, chief veterinarian of the Yuodshilskiy Poultry Plant of Vilnyusskiy Rayon; Yu. Mitskunas, chief livestock expert of the trust of poultry breeding of the Lithuanian SSR State Agroindustrial Committee; Candidate of Agricultural Sciences G. Pilkauskas, director of the Baltic Zonal Experimental Station for Poultry Breeding and the Stanyunay Experimental Farm; G. Ribinskene, livestock expert and breeder of the Anulenay Poultry Breeding Sovkhoz of Telshyayskiy Rayon--for the development and introduction of efficient methods of broiler production in the Lithuanian SSR (1965-1985).

Candidate of Biological Sciences V. Galinis, docent of the Chair of Botany of Vilnius State Pedagogical Institute--for the textbooks "Sistematika nizshikh rasteniy" [The Classification of Lower Plants] (Vilnius, "Mokslas", 1979) and "Sistematika vysshikh rasteniy" [The Classification of Higher Plants] (Vilnius, "Mokslas", 1984).

L. Valyus, chief engineer of the State Printing Plant imeni K. Pozhela; Candidate of Philological Sciences Docent Y. Zinkus, editor in chief of the main editorial board of encyclopedias; Candidate of Geographical Sciences V. Kvetkauskas, deputy editor in chief of the main editorial board of encyclopedias; B. Kurkulis, responsible secretary and deputy editor in chief of the main editorial board of encyclopedias; Corresponding Member of the USSR Academy of Sciences and Full Member of the Lithuanian SSR Academy of Sciences Yu. Matulis, member of the Presidium of the Lithuanian SSR Academy of Sciences; Corresponding Member of the Lithuanian SSR Academy of Sciences and Academician Secretary of the Social Sciences Department of the Lithuanian SSR Academy of Sciences Y. Matsyavichyus; Candidate of Juridical Sciences Docent M. Pozharskas, deputy chairman of the State Committee for Publishing Houses, Printing Plants, and the Book Trade (posthumously); A. Trakimas, deputy editor in chief of the main editorial board of encyclopedias--for "Malaya litovskaya sovetskaya entsiklopediya" [The Small Lithuanian Soviet Encyclopedia], Volumes I-III (Vilnius, 1966-1971), "Litovskaya sovetskaya entsiklopediya" [The Lithuanian Soviet Encyclopedia], Volumes I-XII (Vilnius, 1976-1984), and a supplementary volume (Vilnius, 1985).

Candidate of Pedagogical Sciences E.-Yu. Balchitis, docent of the Chair of Music of Shyaulyay Pedagogical Institute imeni L. Preykshas; P. Daugaravichyus, senior instructor of the Chair of Pedagogy and Psychology and head of the Correspondence Department of the Klaypeda Faculties of the Lithuanian SSR State Conservatory; Candidate of Pedagogical Sciences Z.-K. Martsinkyavichyus, senior scientific associate of the Scientific Research Institute of Pedagogy and director of the Sector of Esthetic Education; V. Surgautayte, senior instructor of the Chair of Pedagogy and Psychology of the Klaypeda Faculties of the Lithuanian SSR State Conservatory--for music textbooks for the 1st-8th grades (Klaypeda, "Shvesa", 1980-1983).

P. Batutis, fisherman of the Ishlauzhas Fish Hatchery of Prenayskiy Rayon; Z. Yonushas, head of the Sector of Flax Growing of the Upitskiy Experimental Station of Panevezhskiy Rayon; Z. Kudryavichene, milkmaid of the Kayshyadoris Horticultural Sovkhoz; K. Mikute, leader of a multiple-skill brigade of the Kretingskiy Rayon Construction Organization; Y. Raulinaytis, leader of a brigade of electricians of the Kapsukas Combine of Grain Products; Y. Sereyke, excavator operator of the Pakruois Reclamation Construction and Installation Administration; P. Silvanavichyus, tractor driver of the Galyunas Kolkhoz of Alitusskiy Rayon; A. Yankauskas, cattleman of the Lenino kyalyu Kolkhoz of Skuodasskiy Rayon--for outstanding achievements in labor and socialist competition, for the increase of the production of agricultural products, and the improvement of their quality.

V. Darguzhis, milling machine operator and brigade leader of the Panevezhis Plant of Engine-Driven Compressors; S.-K. Dzhyugis, chief engineer of the Kaunas Distributing Cold Storage Warehouse; A. Zhvirblis, brigade leader of the Shilute Furniture Combine; A. Zhigyalis, brigade leader of the Kaunas House Building Combine; V. Zmeyauskas, machine operator of the Ionava Peat Enterprise; S. Ilinskaya, fur dresser and cutter of the Vilnius Fur Production Association imeni Yu. Vitas; A. Lubis, leader of a multiple-skill brigade of instrument control men for the production of powdered milk of the Utena Dairy Combine; D.-Yu. Tsibulskene, press operator of the Kaunas Bitukas Plant of

Silicate Items--for outstanding achievements in labor and in socialist competition and for the increase of labor productivity and production efficiency.

WAGE REFORM, STRUCTURAL, PERSONNEL POLICY IN SCIENCE

Moscow PRAVDA in Russian 3 Aug 86 p 3

[Article by Doctor of Philosophical Sciences A. Tursunov (Dushanbe): "The Potential of Sciences. Problems and Opinions"; capitalized passages published in boldface]

[Text] The reform of the system of the remuneration of the labor of scientists, which is now being carried out, as well as the previously implemented reorganization of the USSR Higher Certification Commission are intended to erect a strong barrier in the way of the lack of talent and dullness. In practice everything often turns into curious thing: the new systems leave sufficient room to mediocrities for maneuvering and the subsequent safe passage through the mine field of obstacles and prohibitions.

In any case in the new system of the remuneration of scientific labor not everything was completely thought out. It eliminated the previous privilege of the person with an academic degree, but did not change such a situation, when as before the POSITION, and not the WORK (to say noting of its EFFECTIVENESS), is put in first place.

It is good that now the scientific research institute has a stable wage fund and a broader and more flexible gradation of positions, while its director has comparatively more rights, in particular, for giving incentives. The new system also clearly indicates the source, from which the required assets should be derived: it is necessary to get rid of the scientific ballast, especially those people who have become accustomed to earning through science, but not working in science. However, it is easy to say: get rid of! For in practice the opposite side nearly always proves to have more rights than the director.

Indeed, let us assume that the director decides to change over to a one-stage system of management and to unite the sectors, which are small and have gotten bogged down in work on minor themes, into comparatively large departments. A chain of instances--the scientific council, the corresponding department, and the Presidium of the Academy of Sciences--should sanction his decision. But can the director count on the endorsement of the scientific council, to which the managers of the majority of sectors to be eliminated belong? One thing remains: not without risk for his prestige to maneuver in the limited space

of possibilities--to perform "explanatory work," to seek roundabout ways, to agree to compromises, and so on.

But is it not easier to examine all at once the plans of the reorganization of institutes in the bureau of the corresponding department or even in the Presidium of the Academy of Sciences? These authoritative academic instances could hear and carefully discuss the proposals of the board of directors on the basic directions of the research activity of the institute and make the necessary decision. And the certification commissions, I believe, should not be entirely intra-institute commissions. At any rate "outsiders" should head them, just as the chairmen of the state examination commissions at higher educational institutions.

The question of retirees in science is also very complex and delicate. Is it not time to regulate this quite delicate matter in a legislative manner? For example, taking into account the specific nature of mental labor, it would be possible to increase the retirement age of scientists, say, by 5 years, and then, when solving this problem, to be guided first of all by the interests of the matter.

The "inverse problem"--the question of the young generation of scientists--is no less urgent and difficult. New constructive ideas, the consistent implementation of which, undoubtedly, will help to increase the qualitative level of the training of young specialists, were incorporated in the recently published Basic Directions of the Reorganization of the Higher School. In my opinion, the system of the training of scientists through graduate studies also needs the same kind of reorganization.

During organizational reforms it is also necessary to direct attention to such a no less dangerous phenomenon as the SELF-SEEKING IMITATION of everything that exists or is being newly developed in the center. This trend makes itself felt in the most different spheres, including the scientific organizational sphere. Indeed, how else, except as the pursuit of incorrectly understood national prestige, is it possible to explain the aspiration of some academies of the union republics to copy the themes and structure of central academic institutes and thereby to be in "the front lines" of progress, without having either an adequate material base or personnel for this? Try now to shut down if only a portion of the research themes, which are "prestigious," but are not being performed at the proper research level! For here they will accuse you of a grave sin--SCIENTIFIC PROVINCIALISM.

I am convinced: provincialism in science is not a disease of growth, but an organic defect which is to be eradicated. But the great effusiveness of style should not overshadow the essence of the matter: scientific provincialism often appears not in the themes, but in the METHODS of research, in the very THINKING of the performers.

And there is another thing which has become unbearable.

Under the conditions of publicity and the increase of the critical potential of social consciousness it has become difficult for all kinds of admirers of "easy money" (including in science) to live. But...we will also not forget

another thing: it is also difficult for honest, principled people, especially those who are called upon to head locally the cleaning work begun by the party, to work. Since the people, who for years had been a practiced hand at demagogy, are also rising on the wave of the broad public movement for reform. It is a question not of time-servers or adherents of the policy of playing it safe, whom the poet wittily called "comers to no good." I am speaking about that category of our citizens, which cries more and louder than everyone about social justice, about those "r-revolutionaries," who to the drum beat of high-sounding phrases attempt to conceal their moral unreadiness for changes.

Today the demands on the personality of the manager are increasing sharply. The purity of the moral character of an official and the irreproachability of his moral position are of not less importance than his professional competence and organizing abilities.

Now the most important thing is to change the attitude of people toward work. But this is first of all and mainly a moral question. Therefore, organizational reform should be accompanied not only by the reform of psychology and thinking, the style and methods of work, but also, what is not less important, by a change of the value orientations of the individual.

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ORGANIZATIONAL MODULES IN PLACE OF STANDARDS, SPECIFICATIONS

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 13, 8-21 Jul 86 p 2

[Article by Doctor of Technical Sciences Professor A. Proskuryakov: "Flexible Organizational Modules. New Organizational Standards in Place of Traditional Sectorial Standards, Specifications...."; capitalized passages published in boldface]

[Text] At one time organizational standards (the Unified System of Design Documentation, the Unified System of Technological Documentation, the GSTPP, and others) were a significant step forward in the pursuit of a unified technical policy. However, now they are more and more often being very sharply criticized on the part of developers of new equipment. An enormous number of all-union state standards and sectorial standards regulate any step of the developer, limiting his creativity and initiative. At the same time they make it possible--due to variant readings and mutually exclusive requirements--to place nearly every development "outside the law."

A paradoxical situation also arises in case of the evaluation of product quality. A domestic item which satisfies the state standard, the requirements of which, by definition, reflect the best world achievements, in reality is inferior to the foreign analogue. In other words, the standards do not take into account the social and economic factors which determine the requirements of the domestic consumer. Moreover, the time of the preparation of new standards and the change of old ones is measured in years, which hampers the fulfillment of the initial stages of the development and assimilation of new equipment (SONT).

In order to avoid the listed negative phenomena, in the system of state standardization it is sufficient to regulate only the key, decisive stages of scientific and technical processes. Their detailing should be the business of sectors and enterprises. In other words, a flexible, rapidly readjustable system of organizational tracking should also correspond to the modern flexible machine system. Such tracking consists of lists of standard actions, which are drawn up and accepted for fulfillment at the level of sectors and enterprises. Such sets of operations, which are attached to each organizational process, have already received the name ORGANIZATIONAL MODULES (by analogy with the well-known design and technological modules).

For example, it is necessary to put into operation a machining center. For this one should use an organizational module made up of 15 operations, which are precisely coordinated in time. Moreover--and this is very important--a portion of them should be started and completed before the purchase of new equipment. This is also understandable, for it is necessary precisely in advance to prepare the control programs, to think over with what to load the high-performance expensive equipment and how, who will repair and readjust it, and so on and so forth. Further the interoperation and final checking of the work of the machining center, the removal of scraps, and other questions are specified. Such "algorithmization" of actions will ensure their coordination and will make it possible to start up the equipment rapidly and efficiently.

First, it is necessary to coordinate the content and choice of one organizational module or another with the newly introduced structural components of the equipment being assimilated, as well as with the corresponding technological development, that is, with the technological and design modules. Second, each stage--research, development, technological preparation, and, finally, industrial assimilation--should use its own modules. Their third fundamental difference from other organizational documents consists in the change of the content of the organizational modules by stages of the innovation process--from the appearance of a new idea and its development and embodiment to the change of the concept, which led initially to the development of this object of equipment.

The set of organizational modules can be represented in the form of a cube, along the x axis of which the stages of the development and assimilation of new equipment are located, the y axis--the types of modules (organizational, technological, design, and so on), the z axis--the stages of the innovation process.

In contrast to mandatory standards, the organizational modules are recommended documents. Therefore, they afford the performers greater opportunities for the display of initiative and can be adapted more flexibly to the specific works. Organizational modules are developed and reorganized much more quickly than traditional standards. They can contain specific software of organizational measures and make it possible to form an organizational and technological structure of any complexity with the sharing of responsibility when performing each set of actions.

First of all organizational modules can be created for such processes and stages of the development and assimilation of new equipment and series production as the changeover to the output of new products in case of different paces of the discontinuation of old products; the development of a new item in pilot production, the assimilation of complex equipment, the organization of warehouse services for flexible production on the basis of packages of applied programs, as well as the analysis of the prerequisites and possibilities of robotization.

The set of organizational modules ensures the possibility of their configuration for the fulfillment of large-scale organizational measures. This can be, for example, the retooling of production, the decrease of the expenditures of manual labor, the collective saving of resources, the introduction of low-waste technology, the increase of the quality and reliability of items, and the making of a functional cost analysis of new equipment.

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GOALS OF SCIENTIFIC, TECHNICAL PROGRESS IN MACHINE BUILDING

Moscow MEKHANIZATSIYA I AVTOMATIZATSIYA PROIZVODSTVA in Russian No 4, Apr 86 pp 1-3

[Article: "Toward New Gains"]

[Text] The past 27th Congress of the Communist Party of the Soviet Union discussed and adopted documents, which are of great international significance and are most important for the party and country--the CPSU Program (the new version), changes in the CPSU By-Laws, and the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000.

In the CPSU Program it is noted: "A significant increase of labor productivity has to be achieved on the basis of the acceleration of scientific and technical progress, radical changes in equipment and technology, and the mobilization of all technical, organizational, economic, and social factors." This provision of the Program is basic for the development of the national economy of the country during the 12th Five-Year Plan and the subsequent future.

Specific tasks on the development of the USSR national economy are posed in the Basic Directions, which as if materialize the provisions of the Program.

By 2000 as compared with 1985 labor productivity should be increased by 2.3- to 2.5-fold. This is a significant jump in the growth rate of labor productivity. What does this yield? The increase of the growth of labor productivity by just 1 percent is equivalent to: an increase in the national income of more than 5 billion rubles (or the saving of the labor of about 1 million workers); additionally produced output respectively by industry and agriculture worth approximately 8 billion and 1 billion rubles, an amount of construction and installation work performed in capital construction, which has increased by about 9 million rubles. Consequently, it is necessary to strive for the increase of labor productivity at each workplace and in all the sectors of the national economy.

The key sectors of the national economy, which create the basis for the acceleration of scientific and technical progress--machine tool building, instrument making, the electrical equipment and electronics industries--should be developed most intensively during the 12th Five-Year Plan. Their growth

rate will be 1.3- to 1.6-fold greater than the average for machine building. It is especially important to achieve a drastic shortening of the time of the development and assimilation of new equipment. The machine builders are called upon to rapidly increase the output of equipment of new generations, which makes it possible to significantly increase labor productivity and to decrease expenditures.

It is important to change over from the output of individual machines to the production of technological systems of machines and complexes; the new equipment should be less metal-consuming and energy-consuming.

The more complete use of the possibility of increasing the technical level and quality of machine building products by the further development and intensification of the integration of the sectors of machine building and the specialization and cooperation of production within CEMA is envisaged by the Basic Directions.

Coordinated actions in the development and use of fundamentally new types of equipment and technology in a number of priority directions are outlined in the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, which was adopted at the extraordinary meeting of the CEMA Session.

For the acceleration of the retooling of the sectors of the machine building complex during the 12th Five-Year Plan it is envisaged to increase by fourfold the production of special technological equipment for their own needs. This will contribute to the annual updating of the active portion of productive capital by 10-12 percent.

The increase of the technical level of machine building production is also being supported by the development and introduction of automation. During the 12th Five-Year Plan it is envisaged to speed up by 1.8-fold the pace of the introduction of flexible machine systems and by twofold the pace of the introduction of industrial robots. Automatic equipment with numerical control and built-in microcomputers, rotary and rotary conveyor automatic lines, automated control systems, and computer-aided design systems should be introduced extensively.

The decree of the CPSU Central Committee and the USSR Council of Ministers on the establishment of interbranch scientific technical complexes (MNTK) has been adopted. So far 16 such complexes have been established. The development and production of new advanced equipment are the goal of their organization. For example, the "Robot" Interbranch Scientific Technical Complex is intended for the development of industrial robots for various purposes with the use of them in: robotic technological complexes, flexible machine system modules, and automatic lines. The main organization of the complex is the Experimental Scientific Research Institute of Metal-Cutting Machine Tools. Institutes and organizations of the USSR Academy of Sciences, the Ministry of Instrument Making, Automation Equipment, and Control Systems, the Ministry of the Electrical Equipment Industry, the Ministry of Heavy and Transport Machine Building, and other ministries belong to the interbranch scientific technical complex. The development and production of automatic

rotary lines and rotary conveyor lines for various sectors of the national economy are the goal of the "Rotor" Interbranch Scientific Technical Complex.

The organization of interbranch complexes will speed up the development and introduction in the national economy of new equipment.

The party policy of the acceleration of scientific and technical progress, which is embodied in the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000, is posing great tasks for our economy.

It is necessary already during the 12th Five-Year Plan to obtain not less than two-thirds of the increase of labor productivity by the use of the achievements of science and technology.

The increase of the technical level of production is governed by the introduction of highly productive means of labor, the mechanization and automation of production processes, and the use of highly efficient equipment of new generations. Machine building holds the basic positions in the accomplishment of these tasks. The volume of production in this sector during the five-year plan will increase by 40-45 percent, which is significantly greater than the growth rate of the production of industrial output (21-24 percent).

The improvement of technological processes is of great importance in scientific and technical progress. Thus, during the 12th Five-Year Plan it is planned to increase by 1.5- to 2-fold the use of advanced basic technologies. The use of new technologies--electron-beam, plasma, pulse, biological, radiation, membrane, and chemical technologies--is also envisaged.

The mechanization and automation of production are of no small importance in scientific and technical progress. During the five-year plan the level of the automation of production should increase by approximately twofold. The increase of the flexibility of production--the development of flexible machine systems (GPS), the introduction of automated control systems (ASU), the development of computer-aided design systems (SAPR), and the extensive use of computer technology--is one of the basic tasks of the five-year plan. The production of computer hardware by 1990 will increase by 2- to 2.3-fold.

The role of flexible machine systems is especially great, their introduction will make it possible to increase labor productivity in machine building immediately by several fold.

A responsible task faces machine builders: to shorten to one-fourth to one-third the time of the development and assimilation of new equipment, while in productivity and reliability it should surpass by not less than 1.5- to 2-fold similar products of today. This signifies a qualitative jump in the development of domestic machine building.

During the current five-year plan the number of introduced flexible machine systems and flexible machine system modules should increase sharply.

"The historic mission of socialism," it is noted in the new version of the Program of the Communist Party of the Soviet Union, "is to place at the service of the building of communism the achievements of advanced science, the most perfect and powerful equipment, and the increasing strength of creative collective labor."

By 2000 overall mechanization has to be completed in all the production and nonproduction spheres, a step toward the establishment of automated shops and enterprises has to be taken. Under these conditions the automation of planning and designing, surveying, and scientific and technical work is assuming exceptional importance. A third of the scientific output of the world is produced by 1.5 million Soviet scientists. Therefore, the automation of their labor and the extensive introduction of computer technology will make it possible to shorten to one-third to one-half the time of designing and the elaboration of documents with the substantial increase of the quality.

Many machines and much equipment, which is being produced at present, have an unjustifiably high materials-output ratio; the losses of metal, fuel, lumber, cement, and mineral fertilizers in production and during transportation are still large.

However, even in case of the same expenditures of resources the real possibility exists to increase substantially the yield of the final product. For this it is necessary first of all to constantly observe the policy of economy.

It has been calculated that in case of the saving of only 1 percent of the resources the increase of the national income will come to 7 billion rubles, while it is possible to build about 700,000 new apartments with this money.

It is planned to increase the share of machine building products of the highest quality from 42.1 percent in 1985 to 58 percent in 1990. The problem of the quantitative satisfaction of the need of the sectors of the national economy for machines, instruments, and equipment should be solved precisely on this qualitative basis.

In the accomplishment of this task the fundamental renovation of machine building sectors is acquiring priority importance. The amount of capital investments, which are being channeled into the development of the machine building complex, during the 12th Five-Year Plan will exceed by 1.8-fold the amount of assets which were assimilated during the 11th Five-Year Plan. Not less than half of all investments will be used for the renovation of operating enterprises.

Pilot experimental bases and works will undergo substantial development. On this basis the time for the development and assimilation of new equipment will be shortened to one-fourth to one-third.

During the 12th Five-Year Plan it is planned to decrease the specific metal content of machines and equipment by 12-18 percent and the specific power-output ratio by 7-12 percent. It is envisaged to reduce the consumption (per 1 million rubles of commodity production) of rolled ferrous metal products on

the average by 26-28 percent, steel pipe by 18-20 percent, and rolled nonferrous metal products by 21-23 percent.

The highest world achievements are becoming the guidelines in the output of products by the national economy. During the years of the five-year plan the share of industrial products of the highest quality category should increase by 1.9- to 2.1-fold.

Thus, in 1986 the share of products of the highest quality for the machine building ministries should come to 44.6 percent, the share of products, which are being assimilated for the first time and have been produced for 3 years, should reach 31.3 percent. It is envisaged to remove from production 1,800 descriptions of obsolete equipment.

The Energy Program, which has been adopted in the USSR, envisages among the most important steps of the supply of the national economy with energy resources the substantial increase of coal production.

One of the main directions of scientific and technical progress in the coal industry and the increase of coal production is the leading development of the open-cut method of working deposits.

The cost of coal production by the open-cut method is one-fifth to one-fourth as great as by the underground method, while labor productivity is five- to sixfold greater.

It is outlined by the Energy Program to increase by 2000 the mining of coal by the open-cut method to 56-60 percent. Powerful fuel and power complexes: the Ekibastuz, Kansk-Achinsk, and Southern Yakut, are being established, the Kuzbas and the deposits of Siberia and the Far East are undergoing further development. The largest open-cut mines are the Bogatyr Mine in Ekibastuz (50 million tons a year), the Borodinskiy Mine in Krasnoyarsk Kray (25 million tons), the Azeyskiy Mine in Irkutsk Oblast (15 million tons), and the Neryungrinskiy Mine in Yakutia (11 million tons). Labor productivity at the fields comes to 1,000-1,400 tons a month per worker. Such high results are possible owing to the extensive use of a transportless and a transport-dump system of the working of deposits, the use of a flow-line and cyclical flow-line technology of stripping, the development and introduction of new advanced types of mining transport equipment, and the rapid introduction of the complete mechanization and automation of the processes of coal mining.

Powerful ESh-100/100 and ESh-40/85 walking draglines, SBSh-250-55 drilling rigs of northern design, 120- and 180-ton dump trucks, and 145-ton dump cars are being used at the open-cut mines.

Scientific and technical programs for the 12th Five-Year Plan, which envisage the retooling of the mine stock and complete automation, have been formulated in the coal industry. By 1990 it is planned to increase substantially the level of complete mechanization in the stopes. The labor intensiveness of stoping will decrease to one-half to two-thirds with a reduction of manual labor to ten twenty-thirds to five-eighths.

The output of new equipment for the underground mining of coal under difficult mining and geological conditions is being expanded. KM-103 and KD-80 mechanized complexes are being introduced for the extraction of coal from thin seams (up to 1.2 meters). The series production of ANShch units for steep seams, KGU supports for large seams, and other equipment has been set up.

The use of advanced equipment and technology when carrying out mine workings will make it possible to increase the labor productivity of the drift miners by 25 percent.

The machine builders have already begun the assimilation of the production of new equipment for the coal industry.

Thus, the output of the ZSBSh-200-60 roller-bit drilling rig, which was developed by the special design bureau of the Institute of Mining imeni A.A. Skochinskiy, is being assimilated at the Buzuluk Plant of Heavy Machine Building imeni V.V. Kuybyshev.

In 1986 the first series of 4PP-5 tunnel boring machines is being produced at the Yasinovataya Machine Building Plant. The tunnel boring machine mechanizes the performance of development horizontal and inclined workings along coal, rock, and mixed faces with a cross section of 14-35 square meters. There took part in the development of the 4PP-5: the Central Scientific Research, Planning, and Design Institute of Underground Machine Building, the Avtomatgormash Scientific Production Association, the Yasinovataya Affiliate of the Gipromashobogasheheniye, and the Yasinovataya Machine Building Plant.

The series production of the new KMT mechanized stope complex for work in seams 1.1-2 meters thick with a pitch angle of up to 35 degrees and a roof that is hard to control has been assimilated at the Druzhkovka Machine Building Plant imeni 50-letiya Sovetskoy Ukrainy. The complex was developed by the State Scientific Research and Planning Institute of Coal Machine Building.

During the 12th Five-Year Plan the questions of the increase of petroleum production on the basis of the automation of fields and the introduction of new technologies are acquiring particular importance.

The introduction in Western Siberia of the gas lift method of well operation was begun during the 11th Five-Year Plan. The distinction of this method from others consists in the fact that the petroleum is raised not by pumps, but by means of the injection of gas, which picks it up and carries it to the surface. The gas lift technology is especially effective in new producing regions, mainly owing to the decrease of the labor intensiveness of the maintenance of wells.

The number of personnel at such a well is 40 percent less than at a well with a sucker-rod pump and 34 percent less as compared with a well which is equipped with a set of submersible centrifugal pumps.

The scale of the development of the petroleum industry and the further advance of fields into hard to reach regions are responsible for the need for the rapid automation of technological processes.

The series production of TMS-3 thermomanometric systems for wells with the submersible pump, which was developed by the UkrgiproNIIneft [Ukrainian Scientific Research Design Institute for the Petroleum Industry], will begin in 1986. The principle of the operation of the system consists in the transformation of the indicators of the pressure in the well in case of pump suction and the temperature of the electric motor into a frequency signal, which is delivered through a power cable to the surface. In case of deviation from the given operating conditions the unit shuts off, starting is carried out automatically. The testing of the TMS-3 at the Tatar Petroleum Association showed its great efficiency.

The assimilation of the production of a multilevel control system of facilities of oil fields (wells, well clusters, booster and group pumping stations) based on microcomputers is also envisaged during the 12th Five-Year Plan.

In 1990 as compared with 1985 it is planned to provide a saving of 200-230 million tons of standard fuel, including 75-90 million tons by the development of nuclear power. By 2000 it is planned to meet by saving 75-80 percent of the increase of the needs of the national economy for fuel, power, raw materials, and materials.

In all 1,150 assignments in the priority and intersectorial directions of science, equipment, and technology, which are of the greatest national economic importance, including on the development of machines and equipment of new generations, have been included in the 1986 plan.

In 1986, 37.4 billion rubles are being allocated for the retooling and renovation of operating enterprises, which is 23 percent more than in 1985.

For the purpose of speeding up the updating and modernization of production with respect to all the sectors of the national economy it is outlined by the 1986 plan to increase by 1.7-fold the retirement of obsolete productive capital as compared with the average annual retirement during the 11th Five-Year Plan.

On the basis of the increase of the technical level of production in industry in 1986 it is planned to free conditionally 880,000 people and to obtain a saving from the decrease of the production cost of 5.2 billion rubles.

On the threshold of the 27th CPSU Congress the workers of the Soviet Union adopted increased obligations for 1986. Great importance in these obligations has been attached to scientific and technical progress--the introduction of new equipment, the mechanization and automation of production processes, and the renovation of enterprises.

Thus, the workers of the RSFSR decided: to increase by 20 percent the output of industrial robots; to completely mechanize and automate 3,000 shops,

sections, and works; to install 6,500 mechanized and automatic lines; to change over from manual to mechanized labor not less than 200,000 people.

In the socialist obligations of the workers of the Ukraine it is outlined: to completely mechanize and automate 2,768 enterprises, shops, and sections; to develop 15 flexible machine systems; to introduce 1,800 technological robot systems; to free from manual labor 225,000 people.

Similar socialist obligations have been adopted by all the union republics.

The scale, intensity, and difficulty of the tasks on the acceleration of scientific and technical progress require great efforts from all workers of the national economy, a fundamental turn toward the questions of the quickest use of the achievements of science and technology, the retooling of production, and the increase of product quality.

In the development of scientific and technical progress there is no limit, there are only milestones. The 27th CPSU Congress, which outlined the means of the further progress of our country, is one such historical milestone.

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BIOGRAPHICAL INFORMATION

HONORED INVENTORS OF USSR PROFILED

Moscow NTR: PROBLEMY I RESHENIYA in Russian No 13, 8-21 Jul 86 pp 4-5

[Article under the rubric "28 June Is the Day of the Inventor and Efficiency Expert": "The First Six"; first two paragraphs are NTR: PROBLEMY I RESHENIYA introduction]

[Text] Since the times when on 28 December 1981 the Presidium of the USSR Supreme Soviet adopted the Ukase on the Introduction of the Honorary Title "Honored Inventor of the USSR," it has been conferred on six representatives of the army of many millions of innovators of our country. These are the authors of inventions, which are opening up new directions in the development of science and technology, people, who by their creative work played a special role in the acceleration of scientific and technical progress.

In accordance with the requests of readers, which were addressed to us at the editorial office, the Central Council of the All-Union Society of Inventors and Efficiency Experts, and the State Committee for Inventions and Discoveries, we are telling today about the first honored inventors of the USSR.

L.I. Danilov, candidate of technical sciences, chief mechanic of the Cherepovets Metallurgical Plant, Lenin Prize winner

He is the author of 77 inventions, who became one of the leading developers of high-temperature metallurgical equipment and alloys for it. A new technology of the production of riders for the heaters of furnaces was developed under his supervision. Two-high prestressed rolling stands of the frameless type, which made it possible to cardinally retool rolling and to improve the quality of sections, were developed for the first time in world practice.

The use in the national economy of just 33 inventions of L.I. Danilov, as well as more than 200 of his efficiency proposals provided an economic impact of more than 10 million rubles.

G.A. Ilizarov, Hero of Socialist Labor, doctor of medical sciences, director of the Kurgan Scientific Research Institute of Orthopedics and Traumatology

He is the founder of a new practical scientific direction in orthopedics and traumatology and the author of more than 300 scientific works and 103 inventions.

The methods of G.A. Ilizarov make it possible to treat without bleeding practically all closed fractures of bones and extremities and to compensate for large defects of soft tissues, vessels, nerves, and bones without transplantation and in one stage. The introduction of these methods in the practice of 826 medical institutions in hundreds of cities of the country made it possible to return the health to nearly 300,000 Soviet people and to save annually about 9 million rubles due to the shortening of the time of treatment and the decrease of the expenditures on social insurance.

The inventions of G.A. Ilizarov are being used extensively abroad.

L.N. Koshkin, Hero of Socialist Labor, full member of the USSR Academy of Sciences, winner of the Lenin Prize and USSR State Prizes, honored figure of science and technology of the RSFSR

He is the author of more than 150 inventions, on the basis of which a new class of machines of the so-called rotary type was developed. They replaced the traditional discrete machining of items with continuous machining, which takes place in the process of technological transportation. This increases significantly the output per ruble of total expenditures.

More than 3,000 rotary and rotary conveyor machines, which replaced more than 330,000 units of operating automatic equipment, including imported equipment, are being used in the national economy of the country. This made it possible to increase labor productivity by 4.5-fold and to free 100,000 machine tool operators.

B.Ye. Paton, twice Hero of Socialist Labor, doctor of technical sciences, full member of the USSR Academy of Sciences and the Ukrainian SSR Academy of Sciences, president of the Ukrainian SSR Academy of Sciences, director of the Institute of Electric Welding imeni Ye.O. Paton

He is the author of more than 300 inventions, of which 110 have been introduced.

For 40 years B.Ye. Paton has been elaborating key problems of electric welding and for more than 30 years has managed the Institute of Electric Welding of the Ukrainian SSR Academy of Sciences, the largest in the world.

B.Ye. Paton made a large contribution to the development of butt resistance welding, having developed machines, which are based on 11 inventions, for the welding of pipes 1,420 millimeters in diameter. This made it possible to change the technology of the building of heavy-duty gas and petroleum pipelines, to increase the labor productivity of welders by five- to sixfold, and to ensure the reliability of gas pipelines under the extreme conditions of

the Far North. The economic impact from the introduction of this invention alone came to 2.5 million rubles a year.

The active creative and inventing work of B.Ye. Paton has placed him among the outstanding organizers of domestic science.

S.N. Fedorov, doctor of medical sciences, professor, corresponding member of the USSR Academy of Medical Sciences, founder and director of the Moscow Scientific Research Institute of Eye Microsurgery

He is the author of about 200 scientific works and 41 inventions. For more than 25 years he has been performing effective practical scientific work and is one of the founders of the domestic microsurgical technique of treating eye diseases.

The original design of an artificial crystalline lens, which was developed by him, is well known throughout the world as the Sputnik lens, is protected by patents in the United States, the FRG, Great Britain, Holland, and Italy, and is being used in the treatment of all types of cataracts.

The thousands of operations, which have been performed on the basis of the methods developed by S.N. Fedorov, have made it possible to restore the visual acuity of more than 90 percent of the patients, the overwhelming majority of whom have returned to their former occupations.

A.N. Filippov, chief of the Intersectorial Laboratory of the Hot Molding of Powdered Materials of the Scientific Research Institute of Automobiles and Automobile Engines (NAMI)

He is the author of the method of the hot molding of nonmetallic and metallic powders, which opened up a new direction in powder metallurgy. Composite materials for the production of parts on high-performance rotary equipment, which no longer require further machining, were also developed on this basis.

The parts made of the new materials surpass in their characteristics parts for similar purposes of the leading foreign firms. This saved the country from foreign currency outlays on their importing.

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